# Electrical World

The consolidation of ELECTRICAL WORLD and ENGINEER AND AMERICAN ELECTRICIAN.

VOL. 58. NEW YORK, SATURDAY, JULY 22, 1911. No. 4.

PUBLISHED WEEKLY BY THE

## McGraw Publishing Company

239 WEST THIRTY-NINTH STREET, NEW YORK.

JAMES H. McGRAW, President.
HUGH M. WILSON, 1st Vice-President. A. E. CLIFFORD, 2d Vice-President.
CURTIS E. WHITTLESEY, Secretary and Treasurer.
TELEPHONE CALL: 4700 BRYANT. CABLE ADDRESS: ELECTRICAL, NEW YORK.

EDITOR.....W. D. WEAVER
A. S. M'ALLISTER.....Associate Editor
W. H. ONKEN, JR.....Associate Editor
W. E. KEILY.....Associate Editor
O. H. CALDWELL.....Assistant Editor
G. TISELL.....Assistant Editor
W. T. PEACOCK.....News Editor
S. S. BOIES.....News Editor
FREDERIC NICHOLAS.....Special Contributor
J. R. CRAVATH.....Special Contributor

CHICAGO OFFICE.....1570 Old Colony Building
CLEVELAND OFFICE.....1021 Schofield Building
PHILADELPHIA OFFICE.....Real Estate Trust Building
EUROPEAN OFFICE....Hastings House, Norfolk St., Strand, London, Eng.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico, $3.00 per year; Canada, $4.50 per year. All other countries, $6.00 per year. Foreign subscriptions may be sent to our European office.

Requests for changes of address should be made one week in advance, giving *old* as well as new address. Date on wrapper indicates the month at the end of which subscription expires.

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach this office ten days in advance of date of issue if proofs are desired. New advertisements will be accepted up to noon of Wednesday of the week of issue.

Copyright, 1911, by McGRAW PUBLISHING COMPANY.

Entered as second-class matter at the post office at New York, N. Y.

*The circulation of Electrical World for* 1910 *was* 974,750.
*Of this issue* 17,000 *copies are printed.*

NEW YORK, SATURDAY, JULY 22, 1911.

CONTENTS.

Editorial ..... 197
Convention of the Ohio Electric Light Association..... 200
Chicago Subway Hearings..... 200
Bureau of Mines Electrical Section..... 200
Boston Electric Vehicle Club ..... 200
National Electrical Contractors' Association..... 201
Chicago Electrical News..... 201
Electric Vehicle Service in Springfield Fire Department..... 202
Electric Train-Lighting Development..... 203
Hydroelectric Developments in Sweden..... 204
Municipal Ownership in England..... 205
A Proposed Public Service Commission in Illinois..... 206
Commission News..... 206
Current News and Notes..... 207
Steam Turbo-Generating Station..... 211
Gasoline-Electric Traction in Europe. By Francis E. Drake..... 217
Comparative Thermal Tests of an Electric Fireless Cooker. By Albert A. Somerville..... 219
A. I. E. E. Papers and Discussions..... 221
Cleveland Lighting Rates..... 226
New Cincinnati Rate Schedule..... 226
Central-Station Wiring Proposal to Contractors..... 226
Advertising the Electric Fan..... 226
Report of Electrical Department of Chicago Sanitary District..... 226
Ornamental Illumination in Minneapolis..... 227
Toledo Rates ..... 227
Mercantile Business of a Central-Station Company..... 227
Milwaukee House-Wiring Campaign..... 228
Illumination of the Bronx Office of New York Edison Company..... 229
Special Lighting as Architectural Feature of a Business Building.... 229
Ornamental Street Lighting in Kokomo, Ind. By O. M. Booher.... 230
LETTERS TO THE EDITOR:
Double-Wound Single-Phase Motor. By Edw. Bretch..... 231
Underground Distribution in a Small Town. By Henry Burden.. 231
Nomenclature of Instrument Transformers. By John Gilmartin.... 231
Digest of Current Electrical Literature..... 232
Book Review ..... 235
New Apparatus and Appliances..... 235
Industrial and Commercial News..... 239
General News..... 243
Weekly Record of Electrical Patents..... 248

### HIGH-FREQUENCY SUPERPOSED TELEGRAPHY AND TELEPHONY.

A very interesting and important paper, read before the recent Chicago convention of the American Institute of Electrical Engineers, was by Major G. O. Squier, United States Army, on his system of "Multiplex Telephony and Telegraphy by Means of Electric Waves Guided by Wires." Up to the present time the science and art of electric wireless communication has been built up and enriched with material adapted from the older science and art of electric wire communication. In ordinary wire telegraphy the frequency is very low, speaking from an alternating-current standpoint. Reactances in the circuit are therefore relatively trivial, and ohmic resistances mainly control the strength of the current on the line. In wire telephony, as ordinarily conducted, the effective frequencies run up to 2000 cycles per second and the reactances of the circuit contest with the ohmic resistances for supremacy in determining strengths of current. In wireless telegraphy and telephony, after the electric impulses leave the mast and take their flight over the conducting surfaces of land and sea, they are freed almost completely from the dominion of ohmic resistance and are subject to the control of pure reactance, the power being carried entirely by electromagnetic fluxes permeating the air and free space at frequencies of hundreds of thousands to millions of cycles per second. A special technique and a special department of science have had to be developed to deal with and measure the phenomena produced at such frequencies.

Major Squier's paper indicates a reimportation of the knowledge gained in the wireless arts to the service of wire communication. He employs the methods of wireless telegraphy and telephony upon already existing wires without disturbing appreciably the regular service carried on by such wires. The wireless apparatus brought into connection with such a circuit does not disturb telephonic communication, because its frequency is ultra-audible. On the other hand, the regular low telephone frequency does not disturb the wireless apparatus, because the latter is tuned to far higher rates of vibration. Moreover, the manipulation of the wireless apparatus on the wire circuit is very much simplified and takes far less power than usual, since the current is guided over the circuit wires in one dimension of space, instead of being scattered over the surface of the planet in two dimensions. Consequently, at least for short distances, the signals received are much more powerful with the wireless apparatus over wires than over the sea or land.

From a technical standpoint there is a great gain in introducing these high-frequency methods onto wires. The reactances developed are very large with respect to the ohmic resistances, although the latter are considerably en-

hanced by imperfect current penetration. The phenomena of wire telegraphy and telephony at 100,000 cycles per second are a valuable preparation for the pure reactance phenomena of wireless telegraphy and telephony at the same or still higher frequencies. The sudden transition between the technique of wire and wireless operations will be avoided, and the breach in theory between the two will be filled in. From a practical standpoint the advantage gained by the Squier methods is likely to come more slowly, owing to the special character of the high-frequency generators used. If alternators of 20,000 r.p.m. were easily procured, the diplexing of telegraph and telephone circuits in this way might follow speedily; or if the singing arc could be generally employed, the same result might be expected. Nevertheless, even although the applications come slowly, they may be expected to come surely, and the advantage of a potential duplicate system of communication is a permanent asset that nothing can destroy. The fact that in ordinary wireless communication reactance is supreme is shown by the constant necessity for tuning—that is, for balancing positive and negative reactances. The importance of such tuning manifests itself very clearly in Major Squier's adaptation of these methods to wire transmission. The reactances developed are so large that it becomes desirable, or even imperative, to tune the circuits to the high frequencies employed. As pointed out in the paper, it is difficult to tell at the sending end of a short line whether the wires at the receiving end are disconnected or connected together. With this new method of operation a new chapter in the arithmetic of telegraphy and telephony is opened and a wide field for investigation is developed. There can be no doubt that the results of such investigation will react with great advantage upon the knowledge of both wire and wireless phenomena.

---

### GASOLINE-ELECTRIC TRACTION.

A paper on the development of gasoline-electric traction abroad, published in another column, gives a most illuminating view of those differences in practice which, arising both from difference of temperament and of conditions, cause striking variations between American and European practice. The gasoline-electric car, or rather the car propelled by an internal-combustion engine with electric reducing gear, has been in the field for some twenty years. As Mr. Drake, the author of the paper in question, points out, the earlier attempts were handicapped both by the weight and inefficiency of the early gasoline motor and by the employment of a costly, heavy and generally useless storage battery as part of the equipment. As the early gasoline motors had a very limited range of efficient performance and needed to be worked quite near their full-load rating to obtain even tolerable results, the early experimenters traveled upon the theory of a gasoline motor running continuously at full load and charging a storage battery, from which the electrical supply could be drawn as necessary. The storage battery itself, with its enormous weight and low efficiency, was enough to condemn the scheme, and nothing except stock issues and disappointment resulted. As the gasoline engine, thanks to the automobile, has been improved in efficiency, weight and reliability, it has been possible to work it under good conditions over a considerable range of load, and hence to take up the work of traction either with mechanical coupling, such as is used on the ordinary automobile, or with the electrical coupling. The electrical transmission gearing is simple, reliable and convenient, and the fact that it has found large use abroad is a safe indication that it possesses practically valuable properties. The great difference, which Mr. Drake points out, between the use of such automobile cars here and those abroad is due perhaps to that gloomy obsession of standardization which afflicts so many American engineers. However modest the original intent in developing the gasoline-electric car in America, the end of a short line of evolution has been a heavy motor car of the Pullman type, weighing, as Mr. Drake points out, about 1 ton per passenger seated, and entailing upon the user both large fixed charges and heavy operating expense, due to the huge weight unnecessarily dragged about and necessarily provided with costly equipment. The same tendency is reflected in every part of our transportation systems in this country. The light railway in the sense in which that term is used abroad is almost unknown in America. Its function as feeder to trunk lines is either not recognized or forgotten. Now, the gasoline-electric car is emphatically a car for light and infrequent service, to be used in situations where the traffic is not heavy enough to warrant the construction of a railroad with regular equipment or an electric line of the ordinary sort. Its field is distinctly one separated both from trunk-line service and from that so fully occupied by ordinary electric traction. The requirements of this field have been grasped by the foreign builders, who turn out a light and relatively inexpensive car amply sufficient to do its work and not undertaking to do the work of anything else.

It is interesting to note that the nearer the power units are kept to the sizes familiar in automobile practice the more reliable are the operating results. The high-power car requiring heavy engines of large cylinder capacity is avoided in European practice, and with the adoption of moderate power and moderate speed the applicability of the system to light-railway service is greatly improved. For example, on one of the lines described by Mr. Drake the locomotive, equipped with a six-cylinder, 90-hp gasoline engine and electric drive, weighs 18 tons and commonly is employed to haul two trailers, each weighing 11 tons empty; thus the train with seating capacity of 100 passengers weighs loaded less than 50 tons, which is hardly more than the weight of a single gasoline-electric car of typical American construction. The commercial speed does not much exceed ten miles an hour, and the consumption of gasoline is approximately between 2.5 lb. and 3 lb. per train-mile, certainly an encouraging figure from the economic standpoint, particularly at American prices for gasoline.

Developed along these lines, which are strictly those of the European railway, the gasoline-electric car is giving promise of great usefulness and undoubtedly increasing popularity. What can be done with it in this country is another matter. The development of transportation here seems to have proceeded largely upon the theory that every

line is likely to become a trunk line and every station a metropolis. In the early days of railway transportation these great possibilities of growth were ever present and sometimes were in part justified by the result, but as the development of the country itself has gone on it is perfectly safe to say that certain lines never can in any reasonable period become lines of large traffic, and that certain cities do not have characteristics that make for indefinite growth. Hence one might as well recognize the fact that certain lines of transportation are destined for a very long period to be lines of light service. Such lines may often be conveniently electrified in the ordinary way to good advantage. Where the traffic is too scant even for this, the gasoline-electric car would seem to fill a very useful place, but to fill this place it should be relatively light and cheap to lower the fixed and operating charges to a point justified by the traffic.

---

## STRESSES IN WIRE SPANS.

The calculation of stresses and sags in wire spans is a mechanical problem of great importance to the electrical engineer. The rapid strides made during the last decade in the methods of constructing high-tension transmission lines and of suspending trolley wires for high-speed electric traction emphasize both the importance of the problem and the necessity of going into its refinements. More than sixty years ago Weisbach laid down the fundamental law of the catenary in exact analytical form, but the majority of writers since his time have apparently regarded it as unnecessarily complex. At any rate, we find a large variety of inconsistent formulas, usually offered as approximate, but seldom with the error exactly defined. The best physical example of the catenary is a link chain freely suspended between two rigid supports. Such a chain is resistant only to longitudinal tension and is perfectly flexible when the tension is removed. When the links are made infinitesimally short the chain becomes a perfect catenary. The ordinary calculation of stress or sag with given conditions of loading is not formidable, but with changes in loading the analytical treatment becomes somewhat involved. All materials yield under stress, but return to their original dimensions when unstressed unless the yield point has been passed—that is, within the limits of Hook's law. A change of temperature in the catenary which, for example, lengthens it also increases the sag and increases it in much greater proportion than the heat expansion, provided that the ratio of sag to span is small, or over a few per cent.

This is a peculiar property of the catenary, and one which is responsible for the complex form of the analytical treatment. At the same time that the sag increases the stress decreases, and by reason of the accompanying elastic contraction the catenary tends now to shorten. Obviously these phenomena are simultaneous and must be so treated. Under increasing loads the elastic stretching lengthens the catenary and thus increases the sag, in turn preventing an increase of stress proportional to the increase in load. In practice the perfect catenary is not attained because a continuous wire or a stranded cable is not perfectly flexible and therefore acts to some extent, near the supports, like a continuous girder. And, again, the ordinary support which is assumed to be rigid is actually never so, particularly at tangent intersections with considerable angularity. The flexible support which results with insulators of the strain or suspension type introduces at least one more variable to deal with analytically. Here, of course, there must be not only no possible upward component of wire tension—caused by unequal heights of support—but the tensions from continuous spans must wholly neutralize each other except for a component vertically downward. Difficulties arise when spans of unequal dimensions are joined at a flexible support. These are easily surmountable, of course, by dead-ending the spans, but as this increases the cost it should be done only as careful judgment and experience dictate.

Three papers on the subject here considered were presented at the recent Chicago A. I. E. E. convention, one by Mr. Percy H. Thomas, one by Mr. William LeRoy Robertson and the other by Messrs. Harold Pender and H. F. Thompson, all of which employ a combination of analytical and graphical methods. The papers by Messrs. Thomas and Robertson are notable because both employ the rigorous theory of the catenary, and the treatment presented by Mr. Thomas is especially noteworthy for its brevity. Mr. Robertson also presents an interesting comparison of various formulas for spans with actual measurements on an 80-ft. span. The catenary gives the closest agreement and the parabola is the second choice. These observations ought to be extended to longer spans, flanked by at least one span on each side in order to get the continuous girder effect and determine its magnitude. The paper by Messrs. Pender and Thompson contains a very ingenious graphical solution which is worthy of study. One of the points to be emphasized is the difficulty which attends any attempt to digest these three papers at one sitting and draw conclusions as to the relative facility of methods. It cannot be expected, of course, that three or four authors will make the same approach to a problem which has at least five variables and sometimes more. The differences in nomenclature alone are very confusing in these papers, and the high-tension committee of the Institute could perform a valuable service in selecting proper and consistent nomenclature and establishing—if such a thing is feasible—a standard method or set of methods for handling span problems. This would be of value to engineers generally, and especially in the matter of teaching the subject to engineering students. But what stands out most prominently, perhaps, is the need of comprehensive data in relation to the sleet and wind loads which occur each winter with considerable regularity. We need, of course, to have independent values of wind, sleet and temperature; we also need simultaneous values in all possible combinations. There are two channels of research open. One is the records of the Weather Bureau, and the other is the experience of the wire companies. Both ought to be pursued with diligence and energy, because the largest issue in the whole problem to-day is the assumed loading. Methods of calculation exist in profusion, and elimination for the survival of the fittest is much needed. But of loads we know relatively little and at that point are especially weak.

## Convention of the Ohio Electric Light Association.

The seventeenth annual convention of the Ohio Electric Light Association will be held at Cedar Point, Ohio, on July 25, 26, 27 and 28. The headquarters of the association will be at the Breakers Hotel, where arrangements have also been made for an exhibit. The program, outside of the usual address of the president and the reports of the secretary and treasurer, contains the following papers: *Why the Central Station Should Take Over the Isolated Plant,* by Mr. Waldo Weaver, Tippecanoe City; *Systematic Central-Station Records,* by Mr. O. B. Reemelin, Dayton; *Limiting the Energy Demand and Voltage Variation of a Circuit by Floating a Flywheel Motor-Generator on the Line,* by Mr. A. M. Seeger, Toledo; *Boulevard Lighting System,* by Mr. G. A. Doeller, Dayton; *Advantageous Uses to Which Mercury-Arc Rectifiers May Be Put on Central-Station Lines, by* Mr. T. J. Kermode, Cleveland; *Report of Committee on Motor Application; The Utility Law of Ohio and Its Application to Electric-Light Companies,* by Mr. D. L. Gaskill, Greenville; *Pumping Water for Municipalities and for Irrigation by Electricity,* by Mr. B. H. Gardner, Dayton; *Insurance Rates as Charged Electric-Light Stations in Ohio,* by Mr. D. L. Gaskill, Greenville; *Report of the Committee on Meters,* by Mr. J. G. Gilmartin, Toledo; *Motor-Driven Refrigeration,* by Mr. W. C. Anderson, Canton; *The Use of Tungsten Lamps in Signs and Outline Lighting,* by Mr. W. B. Goudey, East Liverpool; *Progress of Electrical Cooking in Small Towns,* by Mr. P. L. Miles, Cleveland, and *Report of Committee on Electrical Transmission.*

There is a musicale and card party for the ladies on July 25, and an informal dinner followed by a dance in the evening. In the morning of the next day a ladies' bowling party has been arranged, and in the afternoon the ladies will be taken for a boat ride on Sandusky Bay. Later in the day a water-ball game between central-station men and supply men will take place on Lake Erie. In the evening the association will give a banquet to all in attendance, after which a short entertainment will be provided. During the afternoon of July 27 the ladies will have a musicale and card party, and the men will engage in a baseball game. In the evening there will be an informal banquet followed by a vaudeville entertainment and dancing. On the final day of the convention the ladies will have another musicale and card party.

The officers of the association are as follows: President, Mr. E. H. Beil, Youngstown; vice-president, Mr. W. C. Anderson, Canton; secretary-treasurer, Mr. D. L. Gaskill, Greenville.

## Chicago Subway Hearings.

At the meeting of the local transportation committee of the Chicago City Council on July 13 Mr. W. S. Jackson, of New York, explained the proposal of the Chicago Municipal Subway Company. This company desires an ordinance which will enable it to build a comprehensive system of about 46 miles of subway in Chicago for about $65,000,000. The engineering under this proposal would be done by a city commission, the company building the subway for the privilege of operating it for twenty years. Mr. Jackson explained the financial features of this plan at considerable length.

According to an opinion of the corporation counsel, presented at a meeting of the committee on July 17, the city of Chicago has general power to own and construct a system of subways. This applies, however, to subways for the transportation of passengers and not of merchandise. The city may allow utilities owned by individuals and private corporations to use a portion of the space in the subway, provided such use does not interfere with the primary object of street-railway transportation. The expense of the reconstruction and readjustment of such utilities must be borne by the owners. The city has no power to operate a street railway in the proposed subways without a popular vote approving the proposition. However, the city has the power to lease the subways to railways incorporated under the laws of the state for a term not exceeding twenty years. Bonds issued for the building of the subways will be a lien upon that property only, and are not to be included in the general bonded debt of the city.

## Bureau of Mines Electrical Section.

An electrical section of the Bureau of Mines was organized in 1909 to investigate the conditions under which electricity is used underground, and in order to obtain data which will be of assistance to state officials who have charge of the regulation and inspection of mines, and also to those who use or manufacture electrical mining equipment. This section is part of the mining experiment station of the bureau at Pittsburgh. Technical paper No. 4, issued by the Bureau of Mines, sets forth in detail the purposes and equipment of the section, and gives an account of some of its work.

Preliminary investigations on incandescent lamps were made, which showed that certain sizes of lamps when broken ignite surrounding explosive mixtures of gas and air, and tests are now under way to determine the factor of safety of such lamps as have not caused ignition in previous experiments. An investigation is also being carried on relating to the action of acid mine water upon the insulation of electrical conductors. Tests have recently been finished of electrical fuses with relation to their use in mines. Seven different types of inclosed fuses were tested by being mounted in standard clips or holders and placed inside a gas-tight, boiler-iron box, which was provided with means of admitting any desired percentage of gas. The results of the tests were as follows:

1. One or more sizes of all the brands of fuses tested ignited the gas, although in varying degrees. Two brands ignited the gas at once; three brands ignited it in more than 50 per cent of the tests. 2. The principal sources of danger in fuses as they are now designed is the device for indicating whether or not a fuse has acted. 3. Danger from blowing at the relief ports will probably develop in some, and possibly in all, brands if tested with enough generating capacity.

## Boston Electric Vehicle Club.

The Electric Vehicle Club of Boston held a meeting on July 12 which had been postponed from the week previous owing to the nearness of the holiday. Mr. L. A. Tirrell, of the Commercial Truck Company of America, presided, and after luncheon Secretary Gibbs told of advertising work that has been done through the daily newspapers of a sort that is especially timely, in that many horses are being struck down by the heat. On July 8 reading notices, calling public attention to the advantages of electric trucks in hot weather, were inserted in the Boston papers, one of which was generous enough to run the matter as news in its "hot-weather story." He showed a photograph of a grouping of the 114 horse vehicles and 30-odd gasoline cars that are to be replaced soon by electric cars and trucks.

Mr. Tirrell advocated a plan of starting a night school for the instruction of drivers of electric vehicles, particularly trucks, at which instruction will be given in the repair of motor vehicles, besides lectures by experts on matters pertaining to the use and care of the vehicles. The plan met with the approval of the club, which, it is planned, will back the enterprise.

Mr. C. F. Smith, head of the automobile division of the

Boston Edison transportation department, said that drivers are now being trained in his garage and that the plan is very successful. Mr. Kelly, of the Edison Storage Battery Company, of New York, said that Macy's department store, in that city, punishes drivers of electric delivery wagons who fail to take care of their cars by putting them back to driving horse wagons. This has the effect of making them very careful thereafter.

It was voted that the chairman name a committee on the proposed school, and his choice will be announced later. The sessions of the club are suspended until about Sept. 15, subject to special call.

## National Electrical Contractors' Association.

The eleventh annual convention of the National Electrical Contractors' Association was held at the International Hotel, Niagara Falls, N. Y., July 19, 20 and 21. The attendance numbered about 200, representing different sections of the United States and Canada.

One session was devoted to the presentation and discussion of papers as follows: *Relation Between the Central Station and the Contractor,* by Mr. Arthur Williams, New York; *Credit Protection,* by Mr. Franz Neilson, New York; *The Proper Lamp for the Circuit,* by Mr. P. F. Bander, National Electric Lamp Association, Cleveland; *The National Fire Protective Association,* by Mr. F. E. Cabot, Boston; *The Contractor as a Merchant,* by Mr. C. E. Whitehorn, New York; *Co-operation in the Electrical Industry,* by Mr. P. S. Dodd, National Electric Lamp Association, Cleveland. The business of the association was transacted in closed sessions, at which, among other subjects, practical and economic matters relating to labor and other kindred questions were discussed by the contractors.

As usual at these conventions, many forms of entertainment were provided. On the opening day there was a ride for ladies and guests around the falls and to points of interest with Messrs. Emmet Fleming and O. W. Cutler in charge. In the evening a reception and dance was given at the International Hotel, Mr. and Mrs. M. L. Barnes and Mr. and Mrs. P. N. Thorpe receiving. On July 20 there was a banquet for ladies, guests and members, followed by a vaudeville performance. On the following day a trip was taken over the Gorge Route and visits made to the Niagara Falls power houses and to the Catholic College grounds. In the afternoon there was a baseball game between teams of Eastern and Western contractors.

During the convention the Sons of Jove held a rejuvenation at which between thirty and forty new members were initiated, the ceremony being in charge of Mr. A. E. Brock.

The association has made remarkable progress during the past year under the administration of President M. L. Barnes, of Troy, N. Y., the membership having increased over 80 per cent, and the coming year promises to make a similarly good showing.

The officers elected for the ensuing year are as follows: President, Mr. M. L. Barnes, Troy, N. Y.; first vice-president, Mr. Ernest Freeman, Chicago; second vice-president, Mr. H. S. Potter, Boston; third vice-president, Mr. J. C. Hatzel, New York; treasurer, Mr. John R. Galloway, Washington, D. C.; secretary, Mr. W. H. Morton, Utica, N. Y.; sergeant-at-arms, Mr. J. C. Sterns, Buffalo.

## Chicago Electrical News.

### PROBABLE MERGER OF SUBURBAN ELECTRIC COMPANIES NEAR CHICAGO.

It is generally believed, as previously reported in these columns, that the North Shore Electric Company, the Economy Light & Power Company and the Illinois Valley Gas & Electric Company will be merged in one company, which may, perhaps, be called the Chicago Suburban Edison Company. All of the companies named operate in northeastern Illinois, within a radius of 100 miles from Chicago, and all of them are controlled by interests friendly to the Commonwealth Edison Company of Chicago. Mr. Samuel Insull, who is president of the Commonwealth Edison Company, is also president of the three other companies. The North Shore company supplies electricity in the suburban area immediately surrounding Chicago. The Economy company has its operating headquarters in Joliet, where it has a water-power plant on the Desplaines River, and it supplies electrical energy in and near Joliet. The Illinois Valley Gas & Electric Company was formed about a year ago and took over a number of public-utility properties in La Salle, Grundy, Will and adjoining counties in northern Illinois. Its operating headquarters are at Streator, and it may be said to possess the outer belt of territory served by the three companies. The three companies have many interests in common, and an amalgamation has been expected for some time, although no official announcement of the merger has been made at this writing. The combined capital stocks of the three companies which are expected to be merged amount to about $12,000,000, and the combined bond issues outstanding amount to about $5,000,000. The companies serve a very wide area—approximately 3200 sq. miles—and supply public utilities to about 150 cities and villages.

It is reported that the Kankakee Gas & Electric Company, of Kankakee, Ill., and the Chicago & Southern Traction Company, which operates an interurban line between Chicago and Kankakee, will be taken into the new combination. The total capitalization of the Kankakee company is $1,300,000, and it supplies electrical energy in the city of Kankakee and also in the suburban communities of Bradley and Bourbonnais. The Chicago & Southern Traction Company is in the hands of receivers. It purchases electrical energy from the North Shore Electric Company.

### CENTRAL-STATION AND ISOLATED PLANTS IN CHICAGO.

In the report of the department of electricity of the city of Chicago for the year 1910 there is given the following interesting table showing the number of electric-lighting stations and lamps in the city under the jurisdiction of the department:

| | Stations. | Arc Lamps. | Incandescent Lamps. |
|---|---|---|---|
| Commercial companies, central stations | 21 | 17,769 | 3,565,860 |
| Isolated plants | 763 | 19,670 | 877,034 |
| City plants, street lighting | 7 | 12,366 | ..... |
| City plants, isolated, including water works | 13 | 80 | 3,449 |
| Totals | 804 | 49,855 | 4,446,343 |

To most electrical men it will be rather surprising to know that there are eighteen commercial central-station concerns in Chicago. The largest of these, of course, is the Commonwealth Edison Company, with four generating plants, serving 3,406,643 incandescent lamps (3,730,078 on June 3, 1911), 16,857 arc lamps and industrial motors rated at 177,785 hp. Considering rating of motors connected, the next largest concern is the Sanitary District of Chicago, with 10,430 incandescent lamps, 175 arc lamps and motors rated at 12,639 hp. The third on the list in this order is the Cosmopolitan Electric Company, with 48,450 incandescent lamps, 113 arc lamps and motors rated at 3209 hp.

PREPARATION FOR THE NEW STREET LIGHTING OF CHICAGO.

Under its contract with the city of Chicago the Sanitary District of Chicago, which operates the hydroelectric plant on the Chicago Drainage Canal, is to finance an ultimate addition of 10,000 street arc lamps to the 12,300 municipal street arc lamps now in service. The Sanitary District has arranged to purchase the large amount of material necessary for this extension, but some delay has been caused because the exact make of lamp to be used has not been decided. The district intends to use powerful flame-arc lamps, and in its specifications called for 4000 inclosed series alternating-current lamps of this type for initial equipment. Bids were received from the General Electric Company and the Stave Electrical Company under these specifications, the former offering a double-globe lamp requiring trimming every ninety hours, and the latter a single-globe lamp said to be guaranteed for 125 hours. The Stave lamp is a lamp of foreign design, but if it is selected for the Chicago contract the lamps will probably be made in this country by the Westinghouse Electric & Manufacturing Company.

The specifications require that the lamps must be adapted for service on street-lighting circuits, connected in series to a maximum of 100. The lamp must be of the flame type, differentially wound, with superimposed electrodes and focusing arc. Each lamp must be provided with an accessible automatic cut-out. The inner globe, where there is an inner globe, must be of clear glass, not less than 3 in. internal diameter. All lamps must be adjusted for operation on a current of 10 amp, at a frequency of 60 cycles, with from 50 volts to 60 volts at the arc. The watts consumed between the terminals of the lamp must not exceed 465. Under the above conditions the lamp must operate at a power-factor of not less than 78 per cent. The voltage regulation of the arc must be normally between the limits of 50 to 60, and the hours of life specified shall not be less than ninety hours on the average for each trim. The automatic cut-out must be adjusted to extinguish the lamp before the voltage of the arc exceeds 75.

Lamps were supplied by the two companies mentioned, for testing, and were subjected to a test of twelve days' duration at the terminal station of the Sanitary District by Messrs. E. Fenger and A. B. Gates, testing engineers, under the supervision of Mr. E. B. Ellicott, electrical engineer for the Sanitary District. Tests were made with electrodes giving both yellow and white light to show variation or swings in candle-power for an hour's burning. Photometric measurements were made at various angles, and the amperes and volts consumed were also measured. Other tests were made to show the characteristics of the lamps in starting; this is an important feature in flame-arc operation, owing to the resistance of the slag of the electrodes. Furthermore, the temperature rise of the cut-out circuit when in operation was tested. Curves were plotted showing the distribution of light for the two lamps and for both yellow and white light, as well as for American-made and foreign electrodes. The report on these tests is now in the hands of the trustees of the Sanitary District.

As the long-burning flame-arc lamps are practically of a new type and unusually powerful, it was deemed essential by the Sanitary District that a durability test be made, and for that purpose the district offered to purchase 250 of each of the types of lamps submitted and subject them to a sixty-day operating test. This proposal was unsatisfactory to one of the bidders, however, and consequently the selection of the lamp was undecided at the time this was written. It is hoped that at the meeting of the trustees on July 27 some conclusion will be reached. One result of the tests of the Sanitary District seemed to be that there was practically no difference in efficiency whether the electrodes giving white or those giving yellow light were used.

Contracts recently entered into by the Sanitary District for material to be used in carrying out its contract for the city street-lighting extension, in addition to those mentioned heretofore, are as follows: Republic Electric Company, sixteen 250-kva transformers at $829 each; Electric Railway Equipment Company, tubular wrought-iron lamp-poles, standard pipe and extra strong pipe, at the prices named in its bid, approximating $25,000; Fort Wayne Electric Works, oil-immersed constant-current regulators at $284 for each regulator complete; Western Electric Company, 300 miles of No. 6 weatherproof wire at $81.12 per mile; Ferguson & Lange Foundry Company, 2000 cast-iron lamp brackets at $3.40 each.

ANOTHER TELEPHONE REPORT FOR CHICAGO.

At its meeting on July 17 the committee on gas, oil and electric light of the Chicago City Council instructed Mr. Edward W. Bemis, who has just made a report on the gas rates of Chicago, to make an investigation of the affairs of the Chicago Telephone Company to the end that the committee may have further expert information in preparing for the proposed revision of telephone rates. This will be the third report of experts on the telephone-rate subject to be made in Chicago within a short time. The first was a joint report by the Arthur Young Company and D. C. & W. D. Jackson, engineers. This was not satisfactory to the city and was not accepted, although there was no criticism of the engineers' end of the report. Then Mr. W. J. Hagenah, formerly connected with the Wisconsin Railroad Commission, was called in, and he made a very elaborate report on the telephone situation for the committee. Since this report was presented there has been a change in the political complexion of the committee, and now Mr. Bemis has been retained to make a third report, so the subject will be well covered, apparently.

Mr. Bemis made a statement to the committee in which he explained that he would have to examine certain parts of the Hagenah report, such as the present valuation of the plant, the method of figuring depreciation, classification of service, etc. He could not tell in advance how much the work would cost, but said that he would give his service at the rate of $50 a day and expenses. He though the probable cost of his telephone report would be less than $4,000. The Hagenah telephone report cost about $6,000, this sum including the remuneration of Mr. Hagenah's assistants. Mr. Hagenah also made a report on gas rates. This was made under greater pressure and cost about $8,000 or $9,000. The city paid $2,500 for the Young portion of the Jackson-Young report, although the claim is said to have been $3,700. It is said that the compensation for the Jackson end of that report has not been agreed upon. These figures are interesting as indicating the amount of money which municipalities now feel authorized in paying to secure expert information in relation to pressing questions of public-utility adjustment.

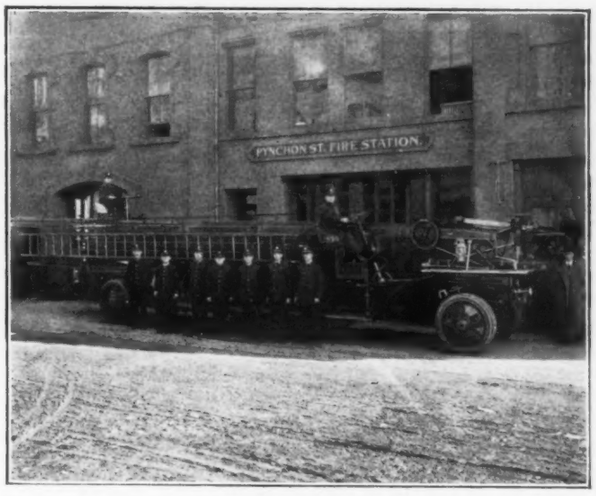
## Electric Vehicle Service in Springfield (Mass.) Fire Department.

Motor vehicles have of late been taking a place of increasing prominence in fire-department service, and where the horse has been discarded the area of protection has been greatly increased, both in urban and suburban fire fighting. The city of Springfield, Mass., has the distinction to be the first in the United States to make a thorough service application of the electric vehicle in fire-department operation, an 85-ft. aerial ladder truck and a combination hose and chemical wagon having been propelled by electricity with entire success since their installation in March of the present year. Marked economies in the cost of operation are indicated by the use of electric vehicles in this important service, and as might have been expected, the apparatus has demonstrated 100 per cent reliability, the fire department executives being enthusiastic in their praise of electric automobile equipment in place of horses.

The Springfield apparatus was selected only after an exhaustive investigation of the best types of gasoline engine-driven fire-department equipment. Energy is supplied by the United Electric Light Company, of Springfield, and the equipment is housed at the central headquarters station on Pynchon Street, in the heart of the business district. New quarters will shortly be taken up in a new and improved station in the Court Square district, the latter being fitted with only motor-driven apparatus and equipped with the latest type of signaling devices, automatic machinery and batteries. No provision for horses is being made in the new headquarters building.

The new electrically driven truck carries a total length of 325 ft. in ladders and a crew of seven men, all of whom are available for service after the equipment reaches a fire. The ladder truck was built by the Seagrave Company, Columbus, Ohio, and is driven by four 3-hp, direct-current motors mounted in the wheels on the Couple-Gear system, energy being supplied from a battery of eighty cells of "National" seventeen-plate, "WBX" storage units. The truck has a guaranteed maximum speed of twenty miles per hour on a level roadway, and on a test run made a half-mile in 1 min. 17 sec., corresponding to a speed of 23.4 miles per hour. The weight of the truck, including its full complement of men, is 10 tons, and it will run about 15 miles at full speed on a single charge. The truck is equipped with a side seat and special steering gear, Sangamo amp-hour meter, motor-driven syren, electric tail-lamp and tungsten head-lamp. The apparatus has five speeds in both the forward and reverse direction.

The combination wagon is provided with a 40-gal. chemical tank and 200 ft. of chemical hose, besides 1000 ft. of regular 2½-in. fire hose. It is driven by four 3-hp motors




Electric Ladder Truck.

on the Couple-Gear system, and weighs about seven tons. Its speed guarantee is 30 miles an hour, and its battery equipment is the same as that of the ladder truck above mentioned. On account of the high speed made by this outfit a "Presto-lite" searchlight equipment has been supplied. An electric horn is provided, and the tail lighting is by electricity. On a 12 per cent grade this apparatus has made a measured speed of 12 miles per hour. The combination outfit was purchased in various localities and the parts assembled by the department organization at Springfield.

Both pieces of apparatus are supplied with energy through a 7.7 Crocker-Wheeler motor-generator set located in the headquarters station. This outfit consists of a 35-amp, 220-volt generator, driven by a direct-connected 500-volt, direct-current motor running at 1175 r.p.m. The motor-starter, battery-charging rheostatic equipment and generator field regulator were supplied by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Flexible cables with plug connections convey the energy to the battery-charging plugs on the apparatus. The charging equipment occupies a space 5 ft. long by 3 ft. wide. A Weston voltmeter and ammeter are installed, and the apparatus can be disconnected within one or two seconds in case an alarm is received during the charging period. About ten alarms per month are at present answered by the electrically driven vehicles, their district in the main covering a radius of 1 mile from the business center of the city.

The results of operation have been satisfactory in every particular. On a test run the ladder truck ascended a 12 per cent grade at a speed of 8 miles per hour. Its reliability is unquestionably superior to that of gasoline, on account of the complexities of the latter equipment. Three new electrically driven hose wagons have just been ordered by the city authorities in spite of the vigorous competition of local gasoline machine manufacturers having a strong foothold in the city. The cost of energy for the first month's service was only $3.78, and for the second month $7.77, the rate being about 3 cents per kw-hour. The initial cost of the motor-driven ladder truck was about $12,000. A first-class horse outfit costs about $5,500, but the annual cost of operation by horses is far greater than with electricity. Three horses cannot be maintained in the condition necessary for fire-department service on less than $1,000 per year. The cost of shoeing horses with the best rubber pads is at least $4 per month. The small cost of energy is noteworthy, and even if a life of but a single year should be obtained from the battery, which is, of course, an absurdly short time of usefulness, there would still be a margin of nearly 100 per cent in favor of electricity. Both Chief Daggett and Assistant-Chief Kimball spoke to the writer in the highest terms of commendation of the electric-vehicle equipment, pointing out that it can be handled more rapidly and safely on the streets than horses, emphasizing the quicker acceleration possible, the readiness with which a higher average speed can be maintained, and especially touching upon the value of the driver as an additional fire-fighting unit, the perfect condition of the engine houses from the sanitary point of view, absence of heavy expense in maintaining exercising outfits and costly planking in stalls, and the saving in time effected through the omission of the usual "quick hitching" of harnesses, opening of stall doors and traversing of the engine-house rooms by horses. There is no question, judging from the experience of Springfield, that the low cost of operation, reliability and speed of service rendered by the electric automobile will result in its general application in fire-department service in this country. On account of the intermittent character of the service and the low mileage usually run off per unit per month, the load of such apparatus does not appear to be very striking in each individual case, but it is essentially of the off-peak or at least the long-hour type, and is worth cultivating by central stations.

## Electric Train-Lighting Development.

The advent of the low-voltage tungsten lamp into the train-lighting field has given a marked impetus to the use of electricity in this class of service. Year by year the standards of comfort on the best American railway trains rise higher, and along with the recent adoption of triple-width window screens in Pullman cars the improved use of fan motors and tungsten lamps is an important factor in the comfort of summer travel. In the latest steel-car equipments considerable detailed study has been given to the selection of lamps and shades, to the provision of adequate control circuits carried in iron conduit, the adoption of artistic fittings, and the arrangement of lighting units to meet the requirements of taste and convenience.

The superiority of electric train lighting has never been better shown than in the recent period of excessive heat, when the atmospheric conditions in Pullmans equipped with Pintsch gas mantles were almost unendurable.

The advantages of electric train lighting are generally appreciated by the traveling public, but the perfection of the latest installations of this service is not so widely known. As a result of the study which has been given to the illumination of sleeping cars the passenger finds himself in possession of a remarkably flexible equipment. In a typical twelve-section Pullman with mahogany finish the principal lighting is accomplished by five four-light pendent fixtures equipped with translucent shades, the fixtures in each case being located above the center aisle about 7½ ft. above the floor. Each fixture is equipped with four 15-watt, 32-volt tungsten incandescents, each pair of lamps being hung at right angles to the other, thus providing for both the longitudinal and the lateral illumination of the aisle and adjacent seats. The location of the fixture centers opposite the bulkheads between the sections on each side enables the occupants of eight seats to read in comfort, the berth lights being available for supplementary service when necessary. As a rule these lights, consisting of 15-watt units, and allotted two for each upper and two for each lower berth, are not required for reading before the curtains are drawn for the night, the distribution from the aisle being adequate for all open-section activities. The combination of the lower-berth lamp pockets with a clothes hook, and the provision of a controlling spring and button with reflector of parabolic type, mark a distinct forward step in the direction of simplicity and convenience. On the hottest night the 15-watt berth lamp may be used with little sacrifice of comfort, the low expenditure of energy being insufficient to raise the temperature of the section perceptibly. Any other form of lighting in such a limited space and behind curtains of an inflammable character would be out of the question.

The lighting of all doorways by overhead lamps of 15-watt rating, and in particular the illumination of vestibules with lamps provided with downward reflectors throwing light upon the steps and hand rails, is an important improvement in detail accomplished during the last few years. The provision of numerous sectionalizing push-button switches, of one or two lamps above each mirror, in addition to the installation of a single unit in the center of the ceiling of toilet-rooms and a three or four-light fixture in washrooms, with about eight lamps in the stateroom, complete the equipment. The cost of operation of a total of about 100 15-watt lamps per car is moderate with the present system of axle generation, and the character of illumination, its steadiness, cleanliness and safety are certain to lead in the future to a still wider use of electricity in the field of train lighting.

## Hydroelectric Developments in Sweden.

Through the work of the Royal Water Power Commission, which was established in January, 1909, accurate figures have been obtained as to the water-power developed and available in Sweden. According to a preliminary report recently published by this commission the total water-power in Sweden is estimated to be 10,000,000 hp during six to nine months of the year, and about 2,500,000 hp during the low-water period. By regulating dams, lakes and rivers the low-water power can be increased to 3,600,000 hp and possibly 5,000,000 hp. Taking into consideration the fact that many power consumers, such as electrochemical factories and certain electrical furnaces, sawmills and pulp mills, can to advantage use the so-called "season power," that is, use more power during the high-water periods, it is estimated that about 3,800,000 hp to 5,000,000 hp could be utilized at present.

According to statistics of 1908 the developed water-power was at the end of that year 420,000 hp, of which 165,000 hp was used for driving electric generators. The total power generated by hydroelectric, steam and other motive powers during 1908 amounted to 930,000 hp. Adding the water-power development finished since 1908 the total water-power output is estimated to be about 600,000 hp, of which about 340,000 hp is being used for driving electric generators. In the above-mentioned statistics the total rating of stations above 500 hp aggregates 450,000 hp. The stations grouped according to rating of turbines are as follows: Three stations larger than 20,000 hp; two stations of 10,000 hp to 20,000 hp; eight stations of 5000 hp to 10,000 hp; 102 stations of 1000 hp to 5000 hp.

The largest rivers are in the northern part of the country, where, unfortunately, the disadvantages for water-power developments are considerable on account of the severe climate and the long low-water period. On account of these facts some of the northern power schemes provide for an actual use of only five to seven months of the year. Owing to the cold climate one power station, at Porjus, on the Lule River, is being built 50 m below the surface, with intake and discharge tunnels of considerable length. In the middle and southern part of Sweden the conditions are more favorable, but not by any means ideal.

The hydroelectric power output during the years 1899-1908 increased by 80 per cent. Practically all the power is used for industrial and municipal purposes. The question of using electrical energy for railway motive power is still in an early stage in Sweden, though experiments have been made by the government under direction of Mr. Robert Dahlander to determine the adaptability of electric motive power for railroads, and the report on the subject seems to leave no doubt that a considerable portion of the State railroads will be electrified in the near future. On one section, Kiruna-Riksgränsen, a distance of 80 miles, the work of electrification has already commenced, as mentioned in the *Electrical World* of Oct. 13, 1910. The power station at Porjus, on the Lule River, is being built and transmission lines installed, for which work the government has appropriated $6,000,000, the installation to be completed in 1914. A railroad connecting Porjus with Gellivare, on the main line between Lulea and Riksgränsen, is also being built, and on Dec. 1, 1910, about 20 miles were finished, the whole distance being 34 miles. This road forms part of the Inland Railroad being built from Gellivare to Östersund, a distance of nearly 400 miles. About 100 miles of the southern part of this road is completed and partly opened. This road will have an ample supply of water-power along its whole length from the large northern rivers, and will along its route open a new country for various industrial enterprises. The country it traverses is very sparsely populated, some of the provinces having only one to five inhabitants per square mile. The government has recently bought waterfalls costing $1,350,000 in the southern part of Sweden, and most likely appropriations will be made by the Riksdag for electrification of other lines of the government railroads.

The government owns at present waterfalls with an effective power of approximately 880,000 hp, of which about 670,000 hp does not require any storage. These figures do not include a number of large falls in Norrland, the ownership of which is in dispute. The largest falls owned by the government are Trollhättan, Porjus and Alfkarleby. Trollhättan is now generating 40,000 hp and has an additional 40,000 hp under development, the ultimate capacity being 150,000 hp. The Porjus plant, now being built, will have 50,000 hp output with provision for an additional 50,000 hp. The Alfkarleby plant is designed for 40,000 hp initial output with provision for considerable future enlargement. Plans for this station have recently been submitted to the government for approval. Some larger falls which the government owns, or claims to own, have not yet been developed.

A number of municipalities have in recent years built hydroelectric plants for electric-railway and street-lighting purposes. Electric street lighting is installed in seventy of the total ninety-five cities in Sweden, and in a large number of towns and small villages all over the country, most of the municipalities buying energy from private industrial plants.

In the zone which extends betwen Gefle and Gothenburg there are an exceptionally large number of plants. This district is a well-populated and well-developed part of the country, rich in mining and other industrial centers. Among the largest power schemes in this section are Trollhättan, Bullerforsen, Gullspang and Kvarnsveden. The government is rebuilding and deepening the Trollhättan Canal from Gothenburg to Lake Vänern at a cost of $6,200,000, which will largely increase the possibilities for industrial development in this part of the country.

In Götaland there are several large power schemes, most important of which are the Yngeredsfors, on the River Atran; four interconnected plants, Majenfors, Bassalt, Upper and Lower Knared, on the River Lagan; Fridafors and Hemsjo, on the River Morrumsan, and Torsebro, on the River Halgean, all of which are private industrial plants. Besides these there are a number of textile and wood mills, pulp and flour mills, etc., which have isolated plants.

In Norrland the principal industries are saw and pulp milling and mining. Sawmills do not, as a rule, use hydroelectric power, most of the mills being driven by steam, using waste for combustion. If, however, a profitable use could be found for the waste water-power would be more commonly used. The wood-pulp industry, the chemical as well as the mechanical, can with advantage use hydroelectric power. The chemical wood-pulp industry needs a more regular power supply than the mechanical, which can use the "season power" to a large extent. This is a great advantage as the northern rivers carry considerably less water in the winter. Recently several large pulp mills have introduced electric motive power, for instance, the Sund Sulphite mill which employs about seventy-five motors for individual drives. Other installations of equal importance are being made. The different industries served and the respective amount of energy consumed by each are shown in the following table:

| | Horse-power |
|---|---|
| Iron industry | 80,000 |
| Wood industry | 140,000 |
| Electrochemical industry | 35,000 |
| Textile industry | 10,000 |
| Lighting and various smaller motor loads | 185,000 |

Up to the end of last year a total of 910 concessions had been granted for electric works and undertakings in Sweden. Those for long-distance transmission have an aggregate rating of 253,300 hp and an aggregate length of line of 2500 miles. Of the total, 127 were granted in 1910 and represent 50,260 hp. The most important are the Bullerfors station, 24,000 hp, belonging to the Stora Kopparbergs Bergslags Company, and the Mockfjärd station, 16,000 hp, of the Grängesburg Company.

## Municipal Ownership in England.

The present status and prospects of municipal electrical supply are discussed in an article in a recent issue of the London *Times*, with particular reference to the recent annual meeting of the Incorporated Municipal Electrical Association. When this society was formed sixteen years ago there were about thirty municipal electric-lighting plants in Great Britain, with a capital of about $10,000,000. Now there are 320 municipal stations, with a total investment of nearly $225,000,000.

Regarding financing of municipal enterprises it is stated that the expectations of early enthusiasts have not been fully realized. The net earnings on about $200,000,000 of municipal electrical capital are, according to the "Manual of Electrical Undertakings," $15,766,125; and after paying $5,691,580 in interest, $5,934,555 to sinking fund, $1,568,545 for bad debts and special charges, placing $1,380,210 to depreciation and reserve, and $1,340,400 to taxes, there is a deficit of $149,165. These figures can hardly be said to show a very broad margin. Interest and sinking fund absorb so much of the net earnings that there is comparatively little left for contingencies or those contributions to the municipal treasury which taxpayers were once taught to regard as a means of reducing their burdens to a minimum.

The members of the I. M. E. A. regard payments to reduce taxes as a vicious policy. Their object is to cheapen and extend the services of electricity as far as possible, and from that point of view the milking of balances by the borough treasurer is considered contrary to the public interest. The city councils have often forced the electricity committee to increase their contributions beyond the limit proposed by the later and in this have always been heartily supported by the gas committees, whose members argue that the electricity department ought to relieve the taxes on the same scale as the gas department. The relative claims of these two public-service departments, which are to a large extent competitive, present one of the most critical problems before the local authorities. The effort of the gas committee is often concentrated upon forcing municipal electric undertakings to charge higher prices, to put larger sums to reserve, to pay more to the taxes, and to take no steps in developing business by advertising and kindred methods. This, it is stated, is a form of pressure which the I. M. E. A. must, for its own sake, resist to the utmost; and its resistance may be supported by the argument that the public is entitled to the best that electricity can offer, at the lowest possible price, independently of the effects that this electrical advance may have upon the progress of gas.

One serious question that will come up before the council of the I. M. E. A. is the matter of raising loans. Not many years ago the process of applying to the Local Government Board for permission to raise loans for electrical development was more or less a pleasant formality. Lately, however, it has become a searching inquisition and there has undoubtedly been some effect in checking outlay upon municipal supply undertakings. Central-station engineers have postponed the evil day as long as possible, and they have been inclined to ask sanction for the lowest possible amount rather than for the sum they would like to spend upon the liberal development of their business. At present a local authority has no means of raising working capital except as part of a special loan. A municipality can raise and spend money only on objects specified when the money is raised by application to the Local Government Board. This system is stated to be inappropriate to the conditions of electric supply progress. The amount of working capital required cannot be estimated far ahead, and there is always a reasonable demand for some simple machinery or for extension of mains and plant which will require extra capital to be raised.

Another important question before the association is stated to be the securing of power by municipal electrical authorities to wire premises and to sell fittings, motors and cooking and heating apparatus. There is a very strenuous opposition against this by electrical contractors, plumbers, taxpayers' associations and even the gas interests, and it is doubtful whether the association will find it advisable to advocate such a measure. It would seem rather to be desirable in the interest of electrical progress to gain the co-operation of the contractors and the electrical trade by not opposing their interests.

### Proposed Public Service Commission in Illinois.

A commission consisting of five State Senators and five State Representatives has been appointed by the Illinois Legislature to investigate the general subject of public-service commissions, with a view to forming a public-service commission in the State of Illinois. This commission will regulate the affairs of electric-light and gas companies, telephone and telegraph companies, heat, water and power utilities and probably street railways. The commission will have ample time to study the subject and make a report, for a year and a half will elapse before the next regular session of the Legislature. Senator John Dailey, of Peoria, is chairman of the commission, and Representative William P. Holaday, of Georgetown, is secretary. The Legislature failed to make any appropriation for the commission's expenses, owing to a political fight, but the members of the joint committee promise to go ahead just the same, paying their own expenses and trusting to the Legislature to reimburse them. They propose to visit Madison, Wis.; Albany, N. Y.; New York and Boston in securing information on the subject of public-service commissions.

### New York Commission News.

The Public Service Commission, Second District, has authorized the Ft. Covington Light, Heat & Power Company to make a first mortgage covering all its properties to secure the issue of $7,000 of bonds. The company is allowed to issue at present $5,000 of bonds to discharge and refund existing obligations, and a hearing is ordered upon the request for $2,000 additional bonds to be used for construction of a concrete dam.

After several postponements, hearings were begun July 13 before Commissioner Maltbie on a series of investigations of certain rates of the Edison Electric Illuminating Company of Brooklyn, alleged discriminations having been called to the attention of the commission. Counsel for the commission placed in evidence the receipted bills of several customers to show the rates under which these customers had been charged, after which the question of minimum guarantee on certain forms of contracts was taken up. Mr. W. W. Freeman, vice-president of the Brooklyn company, testified that the guarantee on a customer's bill depends upon the equipment installed and connected in service. Thus, if a customer has a contract for fifty sockets, he is held to the guarantee on this equipment whether or not all of these sockets are in actual use, on the theory that the actual use of lamps is something entirely within the province of the customer and not known to the company. The hearing was adjourned to July 20, 1911.

### New Jersey Commission News.

The following rulings by the Board of Public Utility Commissioners of New Jersey have recently been made public in printed form:

An indorsement of the policy of regulated monopoly rather than competition was given in the ruling on the application of the Atlantic Highlands Gas Company for the approval of an ordinance passed by the township committee of Shrewsbury. The board held that competition is likely to be short-lived and that the services afforded by public utilities tend eventually to be rendered under conditions of monopoly. Where competing companies serving the same consumers finally unite the unnecessary duplication of plant and appliances entails a permanent burden upon the public. The creation of various boards and commissions with supervisory powers over public utilities and often with eventual powers of rate fixing demonstrates that the illusive doctrine of competition in this field is being superseded by an experimental régime of strictly regulated monopoly. However, exceptional circumstances might exist in particular cases and warrant approval of an ordinance to a competing company. Such conditions were not found to exist in the case under consideration.

In passing upon the continuance by public utilities of existing rates for educational and charitable purposes, the board has announced that the continuance of existing rates which have the sanction of custom, where such rates are presumably of assistance in facilitating education and the administration of charities, and thus in line with public policy, will not be regarded as conflicting with the statute prior to the hearing and determination of specific cases involving the points at issue.

The board has called attention to the fact that its approval of the issue of securities by a public-utility corporation does not imply any confirmation of the business or financial standing of the issuing corporation as a whole. This action by the board was rendered necessary by reason of misleading statements published to influence the sale of certain public-utility securities. The board has also called attention to the fact that it has not authorized the increase of rates by certain public utilities, unfounded statements to the contrary notwithstanding.

The board has ordered the Atlantic Coast Electric Company to print upon each bill rendered for metered service the readings of the meter at the time the charge is made and when the last preceding charge was made, and also a brief, clear description of the company's method for reading meters.

At the June term of the Supreme Court the order of the Board of Public Utility Commissioners restoring a reduced rate of fare to school children over the lines of the Public Service Railway Company was sustained. The court called attention to the carrying of small children free of charge, and claimed that there was no reason why the special rate accorded to school children should be considered unduly preferential.

### Massachusetts Commission News.

The Massachusetts Gas & Electric Light Commission on July 14 gave its decision in the matter of the joint applications of the Greenfield Electric Light & Power Company and the Shelburne Falls Electric Light & Power Company, and of the Greenfield Company and the Colrain Electric Light & Power Company, respectively, determining that the facilities for furnishing electricity for all purposes will not be diminished by the consolidations of these companies and that the consolidations are consistent with the public interest. The applications were heard at the same time. The terms of both consolidations had been approved, at meetings called for the purpose, by votes representing more than two-thirds of the interests of the contracting parties.

The Greenfield company operates in that town and in Deerfield, Northfield and Bernardston. The Shelburne Falls company operates in that town and Buckland. Shelburne Falls is contiguous to Greenfield. The Colrain company supplies electricity in Colrain, which is also contiguous to Greenfield. The Shelburne Falls company was organized in 1909, and in 1910 acquired the property and business of a partnership that had before that time operated under the same name. It issued stock to the amount of $45,000, which is now outstanding. The plant had on April 30, 1911, a book value of $66,401.95 and other assets of $5,891.51, and owed $26,448.36. It has as yet paid no dividends.

The Colrain company was organized in 1908 with capital stock of $2,500. April 30, 1911, it had a plant with a book value of $2,710.58, and other assets of $568.85, owing $1,073.76. It has never paid a dividend. Since June 30, 1910, the Shelburne Falls and the Colrain companies have passed under the control of the owners of the Greenfield

company. With this change of ownership the two former companies ceased to generate and instead bought electrical energy from the Greenfield company. The prices which prevail in Greenfield have been put in force in the other towns and for all practical purposes the three companies have been operating as one company.

By the terms of the agreement to consolidate the Shelburne Falls and the Colrain companies are to convey to the Greenfield company their franchises, locations, moneys and other property and the Greenfield company is to issue and exchange, share for share, at par, 475 shares of its capital stock, respectively, for the outstanding 450 shares of the Shelburne Falls company and the twenty-five shares of the Colrain company. By an order simultaneously adopted the Greenfield company has been authorized to issue 475 shares of new capital stock for the purpose of effecting the consolidations.

The consolidated company will be known as the Greenfield Electric Light & Power Company.

From Sept. 30, 1908, to April 30, 1911, the cost of additions to the Greenfield company's plant, less depreciation and credits, was about $95,000. The company had made at the latter date contracts for additions to its generating plant that were to cost $65,000. The board authorizes, in addition to the issues of the 475 shares for effecting the consolidations, the issue of 1275 shares of new stock, the proceeds of 950 of which shall be used for the purpose of canceling obligations of the company, and of 325 shares to pay for additions to the plant made subsequent to April 30, 1911.

### Ohio Commission News.

The Ohio Public Service Commission still remains the Railroad Commission and will, as in the past, have to give attention to this branch of its work. Consequently, with the additions made by the new public utilities law, it will have its hands full.

It is believed that the Columbus natural-gas rate will be the first real case brought before the new commission. The city has fixed a rate of 30 cents, while the company desires more. It will be for the commission to decide upon the reasonableness of the demand made by the city.

The public utilities law makes it impossible for electric light and power, gas, telephone and other such companies to extend the usual courtesies to ministers, who in the future will receive neither free service nor reduced rates. The only favored ones named in the bill are the federal government, state government and its subdivisions and employees of the companies. Where contracts exist between companies and ministers they will not be abrogated, but when they expire there will be no renewal. This is one among the interesting features that have resulted so far from an investigation of the law.

### Maryland Commission News.

The Maryland Public Service Commission last week postponed until July 26 consideration of the application of the Washington, Potomac & Chesapeake Railway Company for permission to increase its capital stock from $500,000 to $2,000,000 and to issue bonds to the extent of another $2,000,000, the proceeds to be used to complete its road through Prince George's and St. Mary's Counties. Members of the commission were anxious to ascertain the responsibility of the parties behind the project and other information. Mr. Edgar Allan Poe represented Mr. Henry W. Watson, of Philadelphia, who owns the railroad franchise, and, while not able to give at once information sought by the commission, stated that he would gather all the data desired for presentation at a future meeting of the commission. Mr. W. Bernard Duke objected to any recognition of Mr. Watson's franchise on the grounds that holders of the franchise are required to construct at least 5 miles of road each year, a duty that the company had failed to perform; therefore proceedings are in order to vacate the charter. The commission also received a letter from Mr. A. B. Linderman, of Philadelphia, asking for a postponement.

The Baltimore & Virginia Railroad Company, which recently acquired the interest of Mr. Edward Lauterbach, of New York, in what is generally known as the old Drum Point Railroad last week made application to the Public Service Commission for permission to begin construction work on the section running from Millersville through Anne Arundel and Calvert Counties to the terminus on Drum Point Harbor. Plans for financing the road, which has been capitalized at $2,000,000, have, it is said, already been worked out, and application for permission to issue that amount of stock, together with $500,000 in first-mortgage 5 per cent bonds, will shortly be made to the Public Service Commission, which, under the law, must pass on all such matter. The necessary advertisements have been running for about fifteen days. Application for permission to begin construction was made at this time because the issuance of stock is not necessarily a prerequisite.

### Canadian Hydroelectric Commission News.

A controversy has arisen as to whether the present rates for supplying electricity in Brantford, Ont., are higher than in similar cities supplied by the Hydroelectric Commission. At present Brantford is paying 8½ cents per kw-hour for residential lighting, with 10 per cent off for prompt payment, and $48 for arc lamps for street lighting. It is contended by the Hydroelectric supporters in the city that these rates are much higher than those charged in Berlin, Ont. The Western Counties Electric Company, which is supplying electricity to Brantford, has written to the City Council denying that the rates are higher than the prices charged in Hydroelectric municipalities. This company, which is a subsidiary company of the Cataract Power and the Dominion Power & Transmission companies, of Hamilton, Ont., is operating in Brantford under a five-year contract which guarantees rates 10 per cent less than those charged in any Hydroelectric city, the cost of transmission being taken into consideration. A special meeting of the Council will be called to take the matter up. The contract with Brantford was the cause of agitation in the city during 1907 and 1908, owing to the keen competition between advocates of the Hydroelectric Commission and of the Cataract Power Company, and the action of the City Council in giving the contract to the Cataract company gained for Brantford the distinction of being the only municipality that declined to enter into the arrangement made by other western Ontario municipalities with the Hydroelectric Commission for the supply of energy under a thirty-year contract.

## CURRENT NEWS AND NOTES.

DATE OF NEXT YEAR'S N. E. L. A. CONVENTION.—The date for the next convention of the National Electric Light Association has been fixed for June 10 to 14, 1912. The convention will be held in Seattle, unless some unforeseen change is made in the plans.

* * *

ILLINOIS CENTRAL RAILROAD PROMOTES ELECTRICAL STUDY.—Courses announced by the Illinois Central Railroad education bureau for its employees include elementary electricity. Additional courses probably will provide for the study of electric light and power, as well as telegraphy and telephony.

Vermont Electrical Association.—The tenth annual meeting of the Vermont Electrical Association will be held at Lake Dunmore, Vt., Sept. 13 and 14, 1911. Mr. A. B. Marsden, Manchester, Vt., is secretary.

* * *

Automatic Emergency-Brake Operation.—Much favorable comment has been created by the successful operation of an automatic emergency brake on a New York subway train when Motorman W. A. Stone died while the train was running at full speed on July 15. It is believed that the motorman was killed by striking a post while leaning from the side of the cab. The push-button relay switch on the controller handle acted immediately to set the brakes and bring the train to rest within several hundred feet.

* * *

Gas Rates in Chicago.—The Chicago City Council has passed the ordinance fixing the rates for gas for a five-year period at 75 cents for the first year, 70 cents for the second and third years and 68 cents for the fourth and fifth years. It is provided, however, that the company shall be permitted to charge a penalty of 5 cents per 1000 ft. if consumers do not pay their bills within ten days. The People's Gas Light & Coke Company has not accepted the ordinance, and it may refuse to do so, necessitating extended litigation until the courts decide whether the rates offered by the city give the company a reasonable return.

* * *

Los Angeles Energy Rates.—At a recent meeting of the Los Angeles City Council rates for the ensuing year were passed by a vote of six to three to become effective on Aug. 7. The rates are identical with those stated on page 152 of our issue dated July 15. A minimum charge of 50 cents per month per horse-power installed and not less than $1 in any one case was allowed for motor service. A protest received from the Southern California Edison Company, stating that the proposed rates will prove insufficient to produce the income necessary to the proper conduct of its business, was ordered filed.

* * *

Indiana Water-Powers.—State Geologist Barrett, of Indiana, and assistants are locating sites along the rivers of Indiana suitable for water-power purposes. The data collected will be filed with the next Legislature, in which a bill will be introduced to preserve the power site rights to the State. Data concerning such sites will not be at the disposal of private interests prior to official publication. Mr. Barrett is stated to be greatly pleased with the great number of excellent water-power sites in Indiana that might be easily and successfully improved.

* * *

Electric Club of Chicago.—At the meeting of the Electric Club of Chicago on July 12 it was decided to have a letter ballot to determine whether the club shall give a picnic this year. Mr. C. G. Osborne, of the Illinois Steel Company, who was to address the club on electricity in steel making, was unable to be present, and in his absence Mr. A. A. Gray gave a talk on the subject, largely based on a recent paper by Mr. Osborne, describing the Héroult electric furnace at the South Chicago steel works, and originally presented at the American Electrochemical Society's convention in New York last April.

* * *

Wiring by British Central Stations.—The British Municipal Officers' Association is arranging for the introduction into the House of Commons next year of a bill for the purpose of conferring on municipal corporations owning their own electrical works power to wire and fit the houses of consumers of energy in their districts. A government bill including the same subject was passed only after a clause providing for this had been excised. The association appears to have been ready at one time to compromise the situation with the contractors. While the contractors are nominally opposing the proposal, it appears that the gas companies are in reality the opponents, because electricity competes with gas to such an extent as to make it desirable that no facilities should be given to municipal undertakings where the gas works are not also under the control of the local authority.

* * *

The Trade Continuation Schools of Munich.—A publication just issued by the National Society for the Promotion of Industrial Education as Bulletin No. 14, entitled "The Trade Continuation Schools of Munich," deals with the system of industrial education of Munich, where boys are compelled to attend trade continuation schools during their entire apprenticeship or until their eighteenth year. For this purpose employers must release their apprentices for the required number of hours per week for daytime attendance. The report of the Wisconsin Commission upon the plans for the extension of industrial and agricultural education which were submitted to the Governor of that State on Jan. 10, 1911, laid much stress on the possibility and desirability of a modification of the Munich plan to meet conditions obtaining in Wisconsin. The publication may be secured from the secretary of the National Society for the Promotion of Industrial Education, 20 West Forty-fourth Street, New York City.

* * *

Sale of Electricity in Joliet, Ill.—In a letter addressed to the Sanitary District board last month Mr. H. E. Wood, of Joliet, makes a report on the proposal that a company subsidiary to the Sanitary District of Chicago be organized for the purpose of selling electrical energy in and near Joliet, Ill. Mr. Wood declares that there is dissatisfaction with the price and service of the Economy Light & Power Company, of Joliet, and that there should be available contracts for electrical energy to the amount of about 3500 hp. However, the writer does not recommend the organization of a subsidiary Sanitary District company unless the district would co-operate actively in the expense of construction or else give to the proposed new company prices on a sliding scale to meet any price which the Economy Light & Power Company might make. Mr. Wood is of the opinion, however, that something should be done toward the building up of a better feeling between the Sanitary District and the people in Joliet and vicinity. That city is advantageously situated for the benefits of cheap hydroelectric energy, and he says that the business men there seem to think that they are not deriving the benefits they should from this location.

* * *

Light of the Military Tournament at Grant Park, Chicago.—A national military tournament is to be held in Grant Park, Chicago, next week, very similar to the one held in the same place last year. The lighting also will follow last year's plan very closely. Eighty flame-arc lamps will be suspended over the open-air arena and thirty ordinary multiple alternating-current arc lamps will be used about the grounds. The flame-arc lamps are mounted on suspension wires having a span of 600 ft. between 55-ft poles. These suspension wires are composed of ⅜-in. cable, and there are ten of them, each supporting eight lamps. The poles supporting these long spans are guyed to smaller posts and in turn to "deadmen." The ordinary arc lamps are used for general illumination of the grounds, the arena lighting being entirely by the flaming-arc lamps. The latter are suspended 35 ft. from the ground and are supplied with half-round cone-shaped reflectors, open on the side farthest from the spectator. These lamps are trimmed by the use of a street-railway tower wagon, to which a 40-ft. extension ladder is attached. The Commonwealth Edison Company did the installation and is supplying the electrical energy for the illumination, which requires about 69 kw. alternating current being used.

FOUR HUNDRED AND FORTY VOLTS, NOT FORTY, KILL.—By a typographical error in a news paragraph headed "Resistance to Electric Shock" printed last week on page 155 it was stated that a lineman received a "40-volt" alternating-current shock which proved fatal. As may be supposed, the voltage of the circuit was higher than this, although still surprisingly low to cause death. It was 440 volts, not 40 volts.

* * *

NEW CHICAGO POST OFFICE ON OLD WESTERN ELECTRIC PROPERTY.—As a site for the new West Side post office in Chicago Mr. MacVeagh, Secretary of the Treasury, has selected the block bounded by Van Buren, Clinton, Congress and Jefferson Streets. This was the location of the old Western Electric factory in Chicago, and as such is of some interest to electrical men. However, the property had passed out of the hands of the Western Electric Company before the government indicated its choice of a location.

* * *

ELECTRIC IRRIGATION IN CALIFORNIA.—Two farmers, George H. Grover, of Missouri, and H. W. Hosmer, of Idaho, who recently purchased land in Shasta County, Cal., have installed an irrigation system in which the water is pumped from a river adjoining their land by electric power. The former owns 356 acres of land, and the latter 160 acres, and to supply these with water for irrigation a 50-hp motor has been installed which will supply ample water against a head of 28 ft. The area of the combined farms is 516 acres, and it is stated that the cost of irrigation by this method will be $2 an acre per season. It is estimated that through irrigation the productiveness of the land will be increased sixfold.

* * *

TELEPHONIC ENUNCIATION.—In the constant effort of the telephone companies to arrive at the greatest possible clearness in enunciating the numerals used as telephone calls the Chicago Telephone Company is experimenting with a system which has been used elsewhere with success that eliminates the word "double." For instance, the number 5007 has been enunciated heretofore in Chicago as "Five —double O—seven." The new plan would make of this number "Five O—O seven," with a pause as indicated by the dash. The number 100 would be "One—hundred" instead of "One double O." The number 1111 would be "One one—one one," and so on. A part of the plan is to use pauses in a measure corresponding to the grouping of the lines in the telephone switchboard as to hundreds and thousands.

* * *

MUNICIPAL OWNERSHIP IN CALIFORNIA.—The Supreme Court of California has decided a case in favor of a municipality in which it was contended that while the city might have power to supply electrical energy for light and heat it could not supply electric power. The court declared that such a distinction could not be made. With respect to a proposition that one of the articles of the California constitution forbids the granting of power to cities to engage in public-service work where there are private systems of a like kind in operation the court held that the article quoted merely relates to the exclusive privilege to use public streets as a way for conduits and applies only to private companies. While cities have no inherent right to engage in administering public utilities, such permission may be obtained by a grant from the State Legislature.

* * *

ROCHESTER IDEA SPREADS OVER THE COUNTRY.—The idea of supplying the sick with free-fan service, which originated with Mr. R. M. Searle, of the Rochester Railway & Light Company, and which was afterward more widely circulated among the members of the National Electric Light Association at its recent convention in New York City, has spread with remarkable rapidity all over the country. The plan, slightly modified, has been put into effect in fifty-five or more communities in the South, North and West supplied with energy from the public-service companies in the Byllesby group; in Stockton, Cal., and in a number of other places. Newspapers, to which such an attitude on the part of public-service corporations is a revelation, comment favorably on the plan, and it is certain that the value of the advertising thus received more than compensates for the cost of the service gratuitously given.

* * *

INSTITUTE OF OPERATING ENGINEERS.—The first annual convention of the Institute of Operating Engineers will be held in New York City, Sept. 1-3, in the Engineering Societies Building. As this is the first annual meeting, much business of importance will be transacted in the way of adopting a constitution, by-laws, fixing educational and apprenticeship requirements, study courses, etc. The first day's session will consist of addresses by prominent speakers, the appointment of and allotment of work to committees. The second day's session will be taken up with the executive business of the Institute, and the third day with sightseeing. Special rates will be provided for all attending the convention. Ladies who attend with members of the Institute will be entertained by a special committee who will show them the sights. Further information may be secured by addressing the secretary, Mr. Hubert E. Collins, 29 West Thirty-ninth Street, New York City.

* * *

WINNIPEG MUNICIPAL PLANT.—It is definitely announced that the municipal power plant of Winnipeg, Manitoba, will be ready for operation by Aug. 15, and the city authorities have given instructions to take contracts for power dating from Sept. 15. Operation will begin with 8000 hp, which will be increased to 20,000 hp on Dec. 1. One of the substations for distribution is far behind, but it is claimed this will not lead to delay. Work of laying conduits is being rushed. It seems probable that there will be a rate war between the city and the Winnipeg Street Railway Company. The latter has announced that it is prepared to meet whatever rates the city may charge for light and power, that it is in the field to stay, and property owners are cautioned about signing contracts with the city until it is certain what rates the latter intends to charge. A contest is also on between the city and the company over the question of laying of gas mains. The company built a new gas tank and reservoir to which the city objected and the use of which it is endeavoring to prevent. It is alleged that the company laid gas mains without permits, and if upon investigation the charge is found to be true, the police will be ordered to remove the mains.

* * *

COMMONWEALTH EDISON FIELD DAY.—The annual field day of the Commonwealth Edison Company, of Chicago, bids fair to become a permanent event. The second one took place on the afternoon of July 15 on the grounds of the new Northwest station. It was held under the auspices of the C. E. Outing Club, of which Mr. B. G. Jamieson is chairman. The company, however, donated money for the purchase of prizes and also fitted up the grounds for recreation purposes, providing a baseball diamond, a running track, tennis courts, etc. These unusual central-station appurtenances are permanent. The attendance at last week's outing was about 350, including both men and women employees of the company. There was a departmental baseball game between the street department and the engineering department, won by the former by a score of 5 to 4. There was also a regular Commercial League baseball game between the Commonwealth Edison team and the nine representing the Anderson & Lind Manufacturing Company. There were also track and field games, golf, driving, tennis playing, trap shooting and linemen's games, the latter including pole-climbing contests and throwing a weighted rope over a high wire. Valuable prizes were given to the winners of all contests.

Completion of Large Exhaust-Steam Turbines at Milwaukee.—The pair of 7500-kw exhaust-steam turbines added to the Commerce Street station of the Milwaukee Railway & Light Company, and into which steam from the eight vertical cross-compound engines already installed will be exhausted, as described in the *Electrical World* of Feb. 16, are now erected and completed ready for their initial tests. Work is also being begun on the installation of the two 14,000-kw high-pressure steam turbines for which provision is made in the new plant addition.

* * *

International Rubber Exhibition.—Some interesting processes in connection with the cultivation, gathering and manufacture of india rubber were shown at the International Rubber Exhibition, which was held at the Agricultural Hall, London, from June 24 to July 14. The process of rubber manufacture was shown from the collection of the latex to the finishing of the manufactured article. Specimens of new rubber for insulating and other purposes were shown and their qualities demonstrated by tests. In all thirty-two countries were represented and there were over 2000 exhibitors.

* * *

Danger of Illuminating Gas.—In a paper in the May issue of the *Journal of the American Public Health Association*, entitled "The Relation of Illuminating Gas to Public Health," Prof. W. T. Sedgwick and Assistant F. Schneider, Jr., of the Massachusetts Institute of Technology, state that upon investigation they were "surprised, shocked and astounded by the extent to which illuminating gas poisoning is going on in this State and in other states." It is pointed out that the number of deaths from illuminating gas nearly approaches and in cases exceeds the deaths from many common diseases. The remedy offered is a return to the old-fashioned illuminating gas, notwithstanding that its illuminating value is as 16 to 24 compared with that of the dangerous water-gas now almost exclusively manufactured.

* * *

Large Gas Engines for New Gary Power Plant.—The six gas engines being installed as the initial group in the new power house of the Indiana Steel Company at Gary, Ind., are the largest units ever constructed, and have a rating of 3200 kw each. The new engines are of the twin tandem double-acting Allis-Chalmers type, with cylinders 44 in. x 60 in. The engines will operate on blast-furnace gas and are to drive alternators delivering 6600-volt, 25-cycle, three-phase energy to the power network of the Gary mills. Energy from the Gary power house will also be transmitted to the new plants of the American Bridge Company and the American Sheet & Steel Company, west of Gary, and to the Indiana Harbor and South Chicago steel mills of the steel corporation. Three gas-engine sets similar to the new Gary units have been ordered for the Central Furnaces at Cleveland, Ohio, and two other units for the Joliet plant of the Illinois Steel Company.

* * *

Everybody to Tell Time by Wireless.—According to a South Bend (Ind.) horologist, as reported at a jewelers' convention in St. Louis, the watches of the future will be far simpler affairs than they are now. According to this prophet, there will be a great central system of clocks, regulated by Washington Observatory time, and these will propagate Hertzian waves, which in turn will actuate pocket timepieces. A man will take from his pocket a small instrument with a dial, something like the watch of to-day. He will press a button and the hands will indicate the correct time. The mechanism will be simple, it is asserted, and these "wireless watches" will be cheap and need no regulating and practically no repairs. Our watchmaker friend should have given some enlightenment as to the details of the "simple mechanism."

Trolley Induction of Telegraph Circuits.—The Indiana Appellate Court has decided that all that is required of an electric railway to escape damages in an action at law on a complaint that the telegraph system of plaintiff's parallel road is greatly interfered with by induction from the trolley circuit is to show that the defendant company is using the most improved methods to prevent such interference. The court said that a case cited which held that a street-railway company could be prevented from causing electrolysis of a water company's pipes will not support a complaint against an electric railway on interference by induction with the telegraph system of a steam railroad. The title of the case is the Lake Shore & Michigan Southern Railway Company versus Chicago, Lake Shore & South Bend Railway Company.

* * *

2000-hp Swiss Single-Phase Locomotive.—One of the single-phase locomotives for the recently opened Simplon-Lotschberg Railway is equipped with single-phase motors, each of 1000 hp, and exerts a drawbar pull of 22,000 lb. at 26 miles per hour, at which speed it can haul a 310-ton train up a grade of 1:37. The weight is 90 tons. On the neighboring St. Gothard railroad two steam locomotives, weighing together 230 tons, are required to haul a train of the same weight at only 22 miles per hour. The 2000-hp locomotive was built at the Oerlikon Works, the motors being of the Oerlikon single-phase type. Another single-phase locomotive was supplied by the Allgemeine Elektricitäts Gesellschaft, of Berlin. The latter is equipped with two 800-hp Winter-Eichberg motors and draws a train of 250 tons on the maximum gradient at 26 miles per hour. On one section of the Lotschberg line the ascent in 7.8 miles is 1385 ft.

* * *

Single-Phase Railway Adds 60-Cycle Lighting Load.—The Chicago, Lake Shore & South Bend Railway, which operates high-speed, 6600-volt, single-phase electric railway service from South Bend, Ind., through Michigan City and Gary to Chicago, is installing a new 3000-kw, 60-cycle turine-generator set in its Michigan City power house. A new 1000-kw motor-generator set is also being added to the existing equipment of two 500-kw, 60/25-cycle frequency changers, which will be employed for distributing the 25-cycle and 60-cycle demands between the prime movers. The railway company recently completed a contract for the sale of approximately 1,000,000 kw-hours yearly for lighting and motor purposes from its 6600-volt, 60-cycle system and the newly added equipment will enable this load to be divided to advantage between the 60-cycle and 25-cycle generating apparatus. A 1000-kw, 6600/33,000-volt transformer has also been newly added for stepping the transmitted energy up to line potential.

* * *

Overhead Wires in Underground District in Los Angeles.—According to the Los Angeles daily papers, Mr. W. B. Cline, president of the Los Angeles Gas & Electric Corporation, and Mr. C. A. Luckenbach, manager of construction for the same company, are charged with maintaining overhead electric wires in the conduit district of Los Angeles. Both have pleaded not guilty, but it is said that the prosecuting attorney was asked to dismiss the complaint against Mr. Cline, provided Mr. Luckenbach pleaded guilty. For the defendants it has been argued that Mr. Cline, although president of the company, was not responsible for Mr. Luckenbach's acts, and for that reason a dismissal of the charge against the president was asked. However, the prosecuting attorney contends that Mr. Cline was as much responsible for the alleged violation of the law as Mr. Luckenbach, for he was the latter's employer and as such responsible for his acts.

## STEAM TURBO-GENERATING STATION.

### New Power-Plant Development of the Worcester Electric Light Company.

AMONG the interior cities of New England, Worcester, Mass., combines in unique degree the advantages of a large industrial and educational center. For many years the electrical development of the community has progressed along the lines of sound business administration, and, while spectacular departures from standard practice have not been evident, the administration of the local central-station property has been characterized by careful engineering methods and a commercial policy which has constantly yielded a reasonable return upon the investment employed in the company's service. Within the past two or three years in particular the company's business has undergone rapid expansion, and the growth of the city, combined with the limitations of the former generating station, has led the company to build a new and thoroughly modern plant upon an advantageous site, with full provision for the probable needs of many years. Since the inauguration of central-station service in the city in 1883 the business has always been carried on by the Worcester Electric Light Company, local capital being largely employed in its work and the control being maintained at Worcester despite several determined efforts on the part of outsiders to acquire the property.

In the *Electrical World* of Sept. 5, 1908, page 942, an account was given of the development of the company's Faraday Street station, which for about twenty-one years remained the source of the company's production and its most important center of distribution. The first plant built in Worcester for central-station service was located near Franklin Square, a point practically in the electrical center of distribution of the city. Space was so limited here that the growth of the business soon outstripped the rating of the generating plant, which was about 500 hp, the equipment consisting of five high-speed engines belted to generators. The Faraday Street station was built in 1889, and it furnishes an interesting example of power-plant evolution from the low-speed engine and the belted line-shaft generator drive to the use of directly connected engine-driven alternators, and later the installation of a turbine-driven outfit. At the close of its productive usefulness the Faraday Street station attained a generating rating of approximately 4000 kw, and in common with other plants in New England illustrated the marked tendency to adopt alternating-current to the practical exclusion of direct-current service.

The Faraday Street station was limited in respect to economical energy production on account of the necessity of teaming all coal to the plant from the nearest railroad yard, and on account of the relatively high cost of water obtained from Salisbury Pond, on the shore of which the station stands. Given ample facilities for economical coal delivery and a water supply of minimum cost, the plant could have been increased manyfold in rating without exhausting the available space. The building is 200 ft. long by 75 ft. wide, with a commodious basement, and it has the advantage of being within three-quarters of a mile of the Worcester City Hall, the electrical center of the city. Although an initial installation of a 1500-kw turbine set was made in 1908 at this plant, the officers of the company, under the administration of the then president, the late Gen. A. B. R. Sprague, decided to build an entirely new plant in a locality which would be favored by the most economical coal-handling facilities and further benefited by an ample supply of feed and condensing water at nominal cost. A site was found in the southern section of the city on Webster Street, at the border of Curtis Pond, and the firm of Westinghouse, Church, Kerr & Company, New York, was retained as consulting engineers for the development. It was decided to install a turbo-alternator station at this point, with an ini-

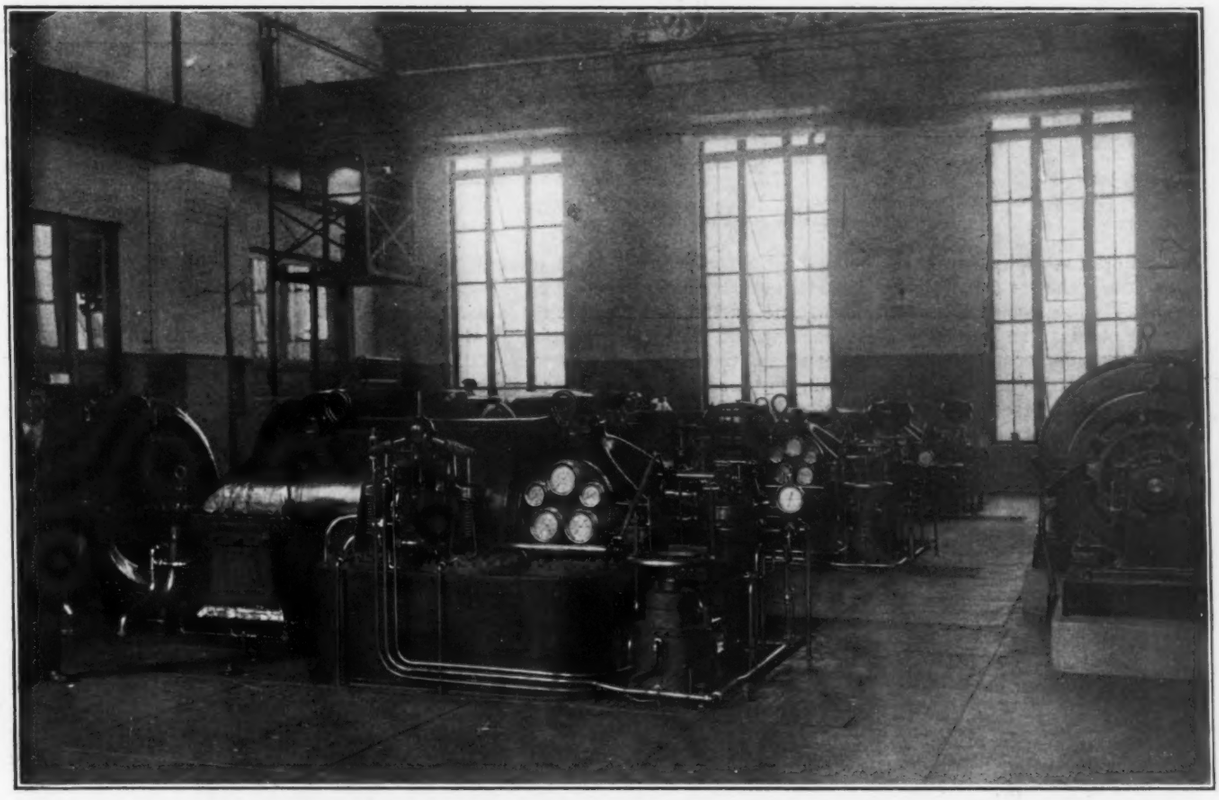


Fig. 1—General View of Turbine-Room.

tial rating of 7500 kva, the building being of sufficient size to permit the installation of a total of 10,000 kva without extended alteration. The new plant has recently been completed by the installation of three 2500-kva Westinghouse units, and it now is carrying the entire load of the system. The Faraday Street station is used as a distributing center, the generating equipment there being held in reserve for either emergency or supplementary service as a steam-driven auxiliary. The company is considering the partial use of the old plant as an auxiliary to another system of supply during the summer months, but has not at this time reached any agreement for the disposal of its surplus energy.

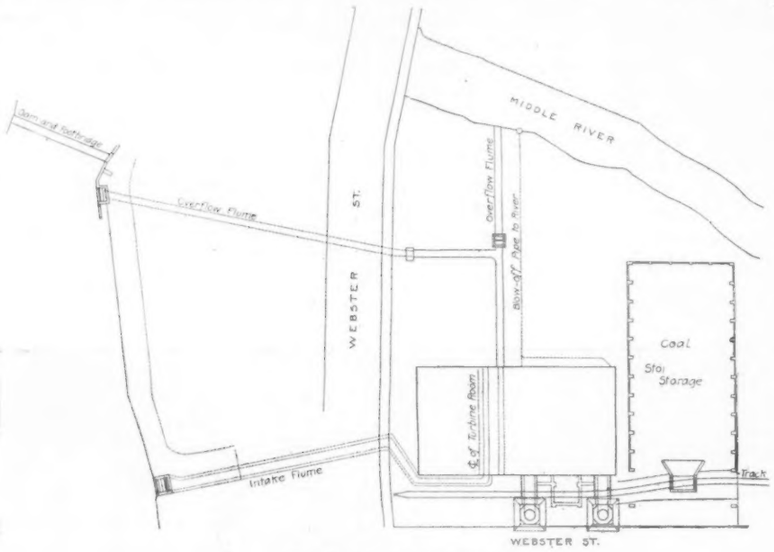



Fig. 2—Location of Plant.

The Webster Street station is located about 3 miles south of the Faraday Street substation, and consequently is about 2.75 miles distant from the City Hall district. The company recognized the fact that the reconstruction of the Faraday Street plant would have been an exceedingly expensive piece of work, even had the fuel and water facilities been favorable. Energy is generated at Webster Street at 2400 volts, three-phase, the frequency of the system being 60 cycles. Although it is transmitted to Faraday Street at present before being used and then distributed from the latter point, the loss is not sufficient to offset the advantages of cheap coal-handling and water facilities. Later a considerable amount of distribution will be effected from Webster Street, feeder and switchboard apparatus having been installed there for that purpose. The new and old plants are now connected by five three-phase, 500,000-circ. mil tie lines carried across the city in underground conduit.

The new plant is a concrete and steel structure supported on concrete foundations, the building being 149 ft. 4 in. long by 79 ft. 7 in. wide. The site of the plant is on Webster Street, between Middle River and Webster Court, the north end of the building being about 181 ft. from the stream. It was necessary to exercise the greatest care in determining the bearing quality of the soil, in order to support the loads imposed by the boilers, turbines and auxiliary equipment. Before beginning construction the company purchased Curtis Pond, with some of its tributary water, which is used for condensing and boiler-feed service. This pond has an area of about 80 acres, and the quality of water is excellent for plant operation, the supply being large and continuous at all seasons of the year. Exhaustive borings were made on the property to determine the character of the soil for foundations, and it was necessary to move the foundations of the two stacks which serve the plant soon after the excavation began. In the main good gravel bottom was found, but on account of a dip, probably caused by an old stream bed, the original site of the chimney foundations had to be abandoned.

The principal external features of the plant are shown in the accompanying plan of the property. These comprise the station building, a coal-storage yard at the east, flanked by concrete walls, two reinforced-concrete stacks 175 ft,. high and 8 ft. inside diameter, intake and overflow flumes connecting the station with the pond and river. Coal is brought to the station by a spur track of the Boston & Albany Railroad, and ashes may be removed by this route if desired. The track is carried westward through the station property over a receiving hopper at the south end of the coal yard and past the south side of the station building over a second receiving hopper, beneath which are located a coal crusher and the beginning of a conveyor system. Above the track and between the two chimneys is an ash hopper of reinforced-concrete construction from which delivery can be made by gravity to the cars. The external coal yard has a holding capacity for about 6000 tons, the present annual coal consumption of the company being about 10,000 tons. The yard is served by a 5-ton Toledo electric traveling

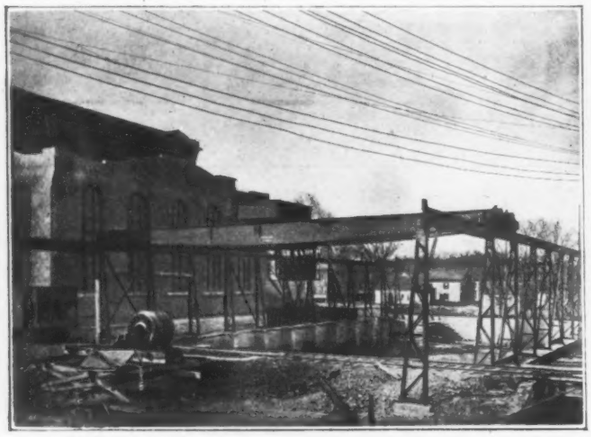


Fig. 3—Coal-Storage Yard and Crane.

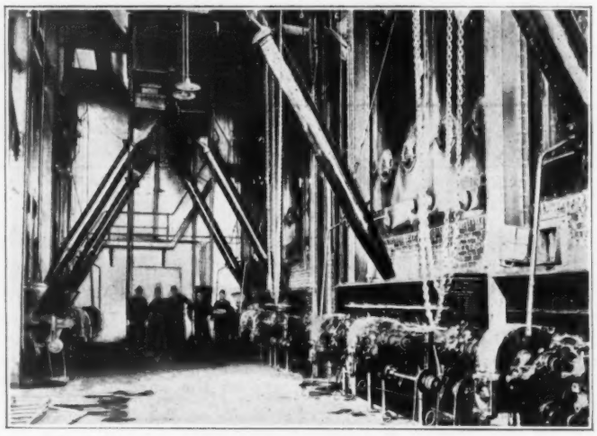


Fig. 4—Boiler-Room.

crane equipped with 220-volt induction motors. This crane has a span of 80 ft. and the length of its runway is about 152 ft., these being the dimensions of the yard. The crane runways consist of I-beams supporting T-rails carried on latticed columns set in concrete pilasters at the side of the yard retaining walls. The crane is provided with a central operator's cab, and can be used either to distribute coal in the storage yard or to transfer it from the yard to cars to be run over the hopper at the side of the plant nearest the stacks. For the latter service a larry car will probably be installed, and arrangements made to handle it by electricity.

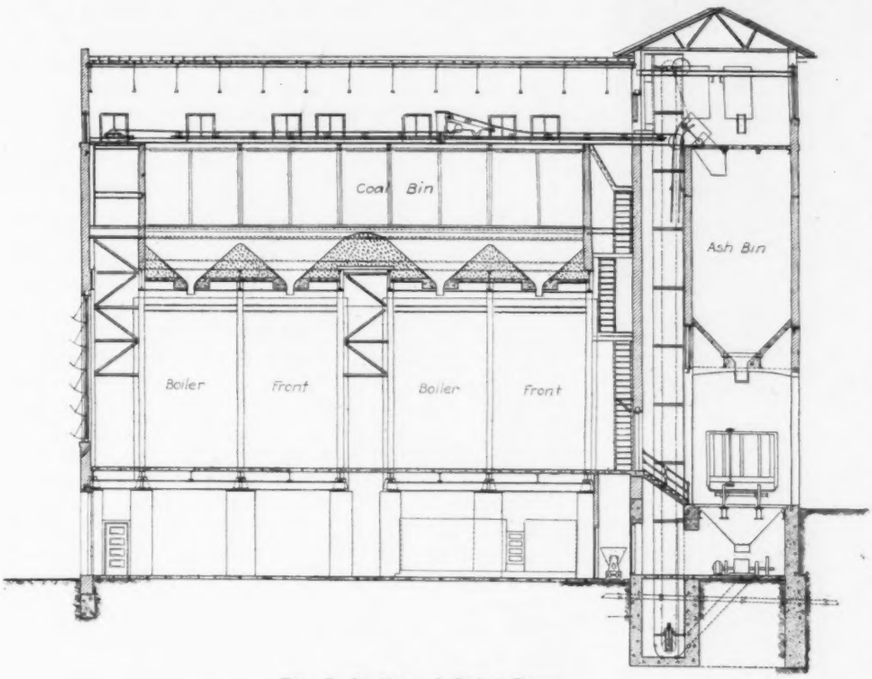



Fig. 5—Section of Boiler-Room.

Between the yard and the pant a driveway about 10 ft. wide has been left for the convenient handling of materials.

The supply of water to the plant for condensing and boiler feed is unusually convenient. An old mill occupied the premises upon which the station stands, and two water-wheels were used in connection with two flumes supplying them from the pond. It was found that with some slight repairs and the construction of new intakes and racks these flumes could be utilized to furnish the new station with water, and a study of the contour of the ground and the pond level showed that the grades allowed the design of a station permitting the water to flow from the pond to the plant in one flume and from the plant back to the pond in the other. This allows a recirculation of water without pumping, a feature highly desirable in the event of low water, since by the avoidance of repumping a consumption of steam for that purpose is obviated, with a resulting decrease in water requirements, in addition to the advantage of being able to use the water over and over again in the boilers. The intake flume consists of a stone-arched conduit lined with concrete of a thickness of about 3 in., connected at the plant with a section of octagonal conduit having an area of 20.5 sq. ft., provided with 12-in. concrete walls and horizontal reinforcing rods. Stop planks and screens are installed at the intake connection with the pond. The intake flume is carried under ground to the station, where it turns by a right angle and crosses beneath the turbine sets, the flume being carried centrally through the foundations of the turbines to the north side of the building, where it is dead-ended. Parallel to the intake flume and about 11 ft. distant from it on

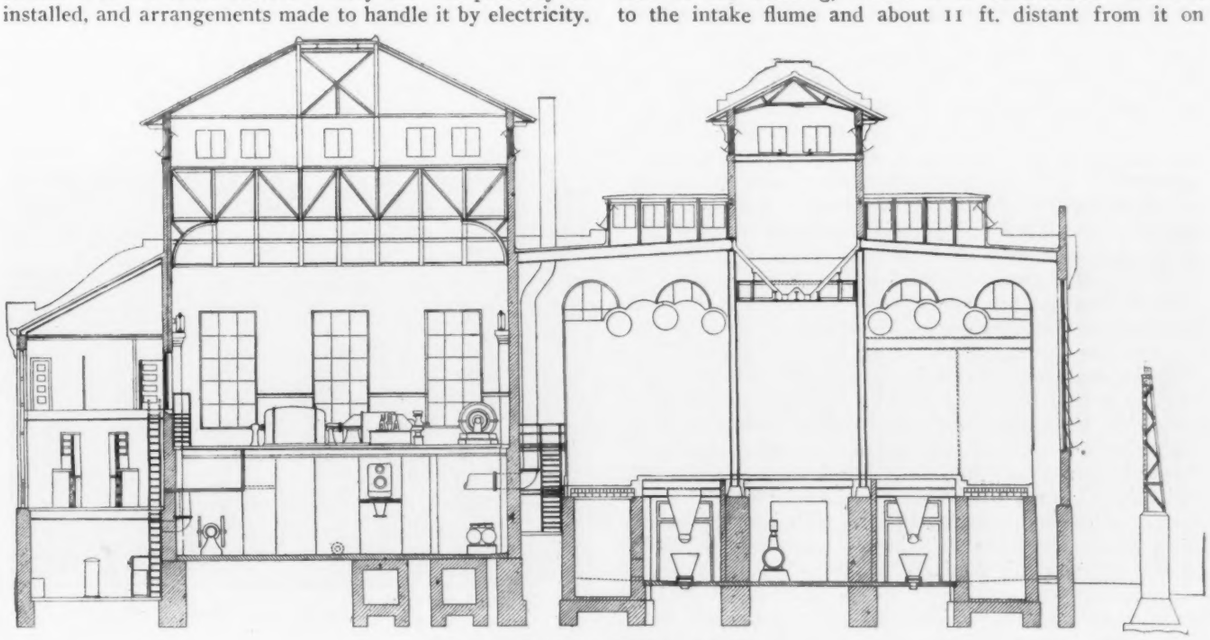


Fig. 6—Transverse Section of Plant.

centers is an overflow flume extending the entire width of the building and across the yard to a discharge basin leading into the river. The overflow flume has a cross-section of 5 ft. 6 in. x 5 ft. At a point about 84.5 ft.

beyond the turbine-room wall an overflow flume of 5-ft. riveted pipe branches from the discharge flume to the pond, the length of the former being about 260 ft. A dam about 75 ft. wide is in service at the north end of the pond to prevent flooding. A gate house is installed at the junc-

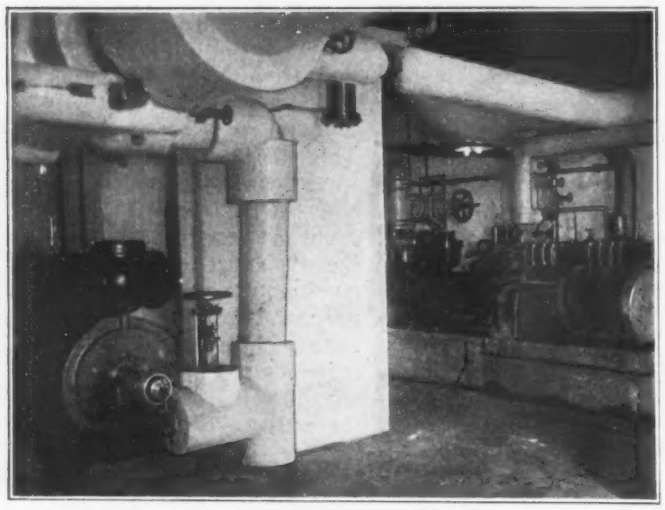


Fig. 7—Circulating and Feed Pumps.

tion of the two flumes to facilitate altering the flow of water, and stop planks are in service at the upper and lower ends of the overflow flume between the pond and the discharge conduit. In normal operation water for condensing steam will flow from the pond to the plant through the intake and thence to the river direct, but in periods of low water a simple valve change at the gate house, with a trifling adjustment of stop planks at the head of the overflow flume, will enable the water to be turned back into the pond after passing through the condensing equipment. The outlet of the overflow flume in the pond and the inlet of the intake flume are about 220 ft. apart, so that there is no danger of interference. Water must flow a total distance of about 700 ft. after leaving the pond before it can again enter it.

The station is divided into a boiler-room, basement, coal bunker, turbine-room and switch house, brick fire walls separating the boiler, turbine and switch sections. The basement is also divided into sections, the coal and ash-handling equipment, pumps and other auxiliaries being well segregated. There are installed six 600-hp Stirling boilers in three batteries on each side of a central firing aisle. The boilers are equipped with Taylor automatic stokers of the seven-retort size, supplied by the American Ship Windlass Company, of Providence, R. I. The blower engines for these equipments are located in the basement below the boiler-room. Coal received at the hopper outside the boiler-room passes through the crusher, which is driven by a 20-hp induction motor, and from the latter it is carried by a belt conveyor driven by a 15-hp induction motor to the top of the building, whence horizontal distribution is accomplished to various sections of a reinforced-concrete bunker located above the boilers and having a holding capacity for 450 tons. Delivery of fuel to the stoker hoppers is effected through spouts equipped with hoppers holding about 700 lb. each. No weighing devices are installed, but records are maintained of the number of delivery hopper emptyings handled. Ashes are removed from the building by a skip hoist which is charged by ash cars running in the boiler-room basement on a track of 20-in. gage located beneath the ash hoppers of the furnaces. These ashes are delivered by the skip into an overhead storage bin of 100 tons holding capacity located above the railroad track outside the building, or, if desired, the ashes can be used for filling the yard on the north side of the plant. The coal-and-ash-handling equipment, including the crusher, conveyor, collecting and distributing apparatus, was installed by the Exeter Machine Company, Pittston, Pa. The ash-handling skip hoist, which is driven by a 20-hp induction motor, is designed to receive a load of ashes and upon the pressing of a button to rise to the top of the building, where it automatically discharges into the ash bunker. If desired, the ashes can be discharged from this bunker by gravity into wagons for city distribution.

The boiler-room is large enough to admit a fourth battery without extension, the room being about 76 ft. wide and 56 ft. in height. The boilers are equipped with superheaters which raise the steam temperature about 100 deg. Fahr. for delivery to the turbines, and they are designed for operation at a pressure of 200 lb. per square inch maximum. The grates are designed to burn mixed anthracite and bituminous coal. The steam piping has been assembled with pipe having welded flanges, the latter being welded on by the old-fashioned coke-furnace method. The fittings are of cast steel and the valves have cast-steel bodies. The arrangement of piping is such that any boiler or any header section can be cut out without interfering with the service. The same care has been exercised in the design of the feed piping, two feed pumps being installed and so arranged as to make it possible to feed the entire boiler equipment with either pump through a duplicate feed main. The feed-water heater is a 5000-hp Whitlock equipment. The ordinary operating steam pressure is about 175 lb. A monitor is installed at the top of the boiler-room above the coal-conveying equipment, and this, with the turbine-room, is provided with a tile roof. The boiler-house proper is provided with a tar and gravel roof. Additions to the plant will be made on an extension of the present center line of the boiler-room and symmetrical with the present installation. This will allow the convenient extension of the coal-distributing machinery and will make the unloading, elevating and handling equipment applicable to the plant when extended. The firing aisle is 18 ft. in width

Two Warren boiler-feed pumps are installed with 10-in x 18.5-in. x 9-in. x 18-in. cylinders, arranged for duplex-compound operation. Each pump draws water through an 8-in. suction line from the intake conduit, and thence delivers it to the heater, which is by-passed for convenience. Beyond the heater, which receives the steam discharge from the auxiliaries in the usual manner, two 6-in. feed lines are carried across the boiler-room as far as the fronts of the batteries nearer the turbines, one line being contin-

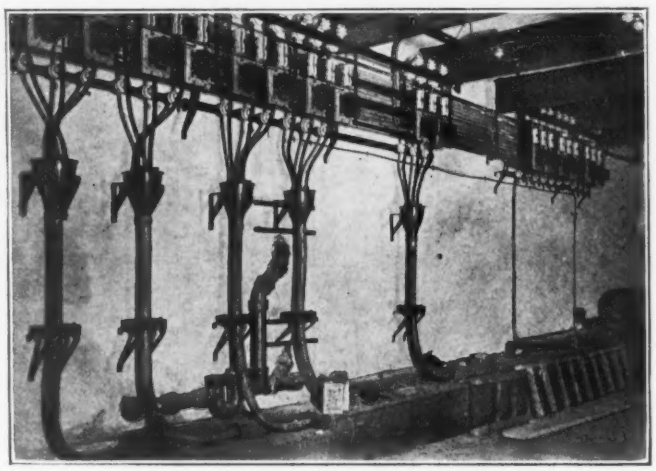


Fig. 8—Outgoing Tie Lines.

ued to the boiler fronts on the further side. The individual boiler feeds are obtained through 3-in. connections leading into the drums. These connections are piped to a 4-in. feed trunk line, running across the fronts of the batteries on each side of the firing aisle, and the two trunk lines are connected at the ends of the batteries by 4-in. cross-lines

forming a complete loop by means of which any boiler may be fed from either pump or trunk line with or without the use of the feed-water heater. Numerous valves are installed to facilitate the operation of the loops. All live-steam drips are collected and returned to the boilers by the Holly loop system. The valves on the main supply lines, when above the reach of the fireman, are provided with extension spindles and handles, so that rapid operation from the floor level is readily effected. Special care has been taken in the plant to provide for the incandescent lighting of all steam and water gages. The wiring for auxiliary lighting and motor service throughout the plant is carried in conduit, with "Condulet" fittings at all connection and outlet points. The boiler blow-off lines are 2.5 in. in diameter, and each is run to a 4-in. outgoing line which discharges into the Middle River about 178 ft. north of the building.

The live-steam piping of the plant provides for continuous and flexible service under all except the most extraordinary conditions. From each boiler a 5-in. steam delivery outlet connects with a 10-in. header, which is carried completely around the boiler-room in a closed loop, the boilers in the east battery feeding into one side and the two west batteries feeding into the other. The two sides of the loop are also connected by a 3-in. main from which 2-in. steam lines are run to the stoker engines in the boiler-room basement. From the header on the side next the turbine-room 8-in. risers lead to the individual turbines, the valves being installed on the turbine-room side of the wall. In the turbine-room basement a 6-in. auxiliary steam header is provided, with connections to the main boiler-room header at each end of the station, forming another closed loop which provides for normal and emergency operation of the auxiliaries.

The principal live-steam connections made from this header include a 3-in. line to each condenser air pump beneath the turbine equipment and 2-in. lines to the individual boiler-feed pumps and dry-vacuum pumps, all of which are installed in the basement of the station. Two small oil pumps for turbine service are installed in the basement, each being supplied through a 0.5-in. steam line. The plant is equipped with two turbo-exciters, each of which is served by a 4-in. steam line from the auxiliary header. An 11-in. x 12-in. x 13-in. Westinghouse steam-driven air compressor is installed in the basement for general cleaning service about the plant. No single line of piping outside the short

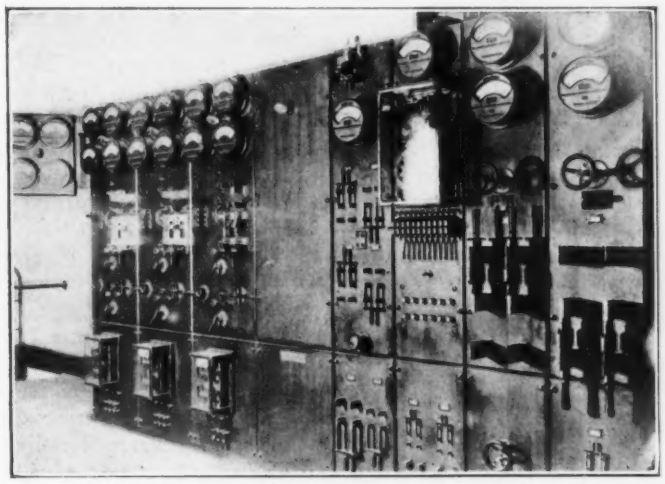


Fig. 9—Generator Switchboard.

local connection to the header is depended upon as the sole reliance of any equipment in relation to steam supply.

The present turbo-alternator installation of three units operating at 3600 r.p.m. is placed in the generator room with the axes of the units at right angles to the boiler-room wall, thus permitting a symmetrical expansion of the plant parallel to the lines of future boilers. The turbines are placed next the boiler-room, giving the minimum length of high-pressure piping and allowing the condenser installation to be compactly arranged. Each turbine exhausts into a Wheeler counter-flow jet condenser of new design, the condenser being placed directly below the turbine in the basement.

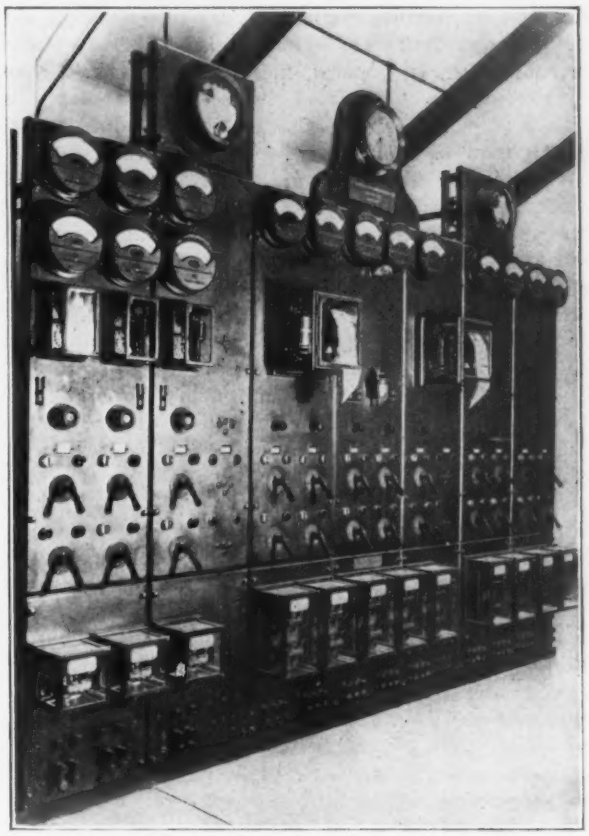


Fig. 10—Feeder and Tie-Line Switchboard.

The water is introduced in the condenser at the upper corner into an extended trough or pan, from which it overflows through numerous short tubes, falling into a second or similar pan provided with overflow pipes and a weir, finally falling into the lower part of the shell, and thence to the discharge outlet. The steam passes horizontally through a shower of water at the first level, ascends to the second level, passes through an upper shower, and finally all that is left of the steam vapor, together with the air and other gases, passes over the entering and coldest water at the top of the dry-vacuum pump suction, which is located in the upper part of the shell. The cross-section of the passage traversed by the steam continuously diminishes as the volume of steam is reduced by condensation and consequently a steady velocity is maintained throughout, leaving no dead pockets in which air might accumulate. In this condenser it is impossible for any steam to pass to the air-pump suction pipe without having traversed all the sprays, and the water is finely divided by small baffles hung below the tubes. In some of the older types of direct-contact condensers the condenser cone was substantially an open chamber in which the hot steam would naturally rise to the top while the air would fall to the bottom. This is the opposite of a desirable condition, for if an air pump receives steam instead of air it works most inefficiently, while the air continues to accumulate until the vacuum is seriously lowered. In the Worcester plant a 29-in. mercury-column vacuum is readily maintained. Each condenser is equipped with a 12-in. centrifugal circulating pump directly driven by a 50-hp Kerr steam turbine making 1000 r.p.m. and a Wheeler 9-in. x 22-in. x 12-in. dry-vacuum pump operating at 90 r.p.m. A

centrifugal priming pump is installed in the basement for starting the circulating-pump service, the former being driven by a 10-hp induction motor running at 850 r.p.m. A steam-driven 6-in. x 8.5-in x 6-in. general service pump is also in use in connection with the water supply for washing, toilet and other purposes.

Each condenser is connected with an outward exhaust line 20 in. in diameter, which terminates in a head above the roof level. In general, the auxiliary exhaust lines are brought into a 14-in. main, from which a connection is taken off through a Davis back-pressure valve, the former leading to a 14-in. outboard exhaust. Other connections provide for the use of the auxiliary steam in the feed-water heater, as in usual practice. The normal method of operation carries the exhaust steam from each auxiliary through the heater to a suitable drain outlet, and the condensation from the turbines is delivered to the discharge conduit beneath the turbine-room and thence carried to the river or pond as may be desired. The Kerr turbine equipments exhaust into 6-in. lines leading directly to the trunk exhaust in the basement, the dry-vacuum pumps exhaust through 2.5-in. lines into a 4-in. main leading to the trunk, the boiler-feed pumps exhaust through 4-in. lines leading to the trunk, and the stoker engines deliver exhaust steam through 3.5-in. lines connected with the trunk by a 6-in. main. Each exciter turbine delivers its exhaust into the trunk line through a 10-in. line. An extensive system of iron galleries has been built in the basement of the plant to facilitate access to the valves on the piping, and the piping has been painted the following colors to enable the attendants more readily to distinguish the different lines: High-pressure steam, cream; Holly system, cream with red band; exhaust steam and drip piping, yellow; steam-heating system, drab; boiler-feed lines, light blue; boiler blow-off, dark blue; water drains, light blue; air piping, green, and oil piping, uncovered, pink.

The electrical switching arrangement and cables occupy space on three levels in a switch house or annex to the turbine-room on the west side of the building. The basement-floor grade is depressed to permit convenient access to the outgoing underground conduit lines and also to avoid carrying the switchboard-room too high above the rest of the plant, which would have cut off light and ventilation from the turbine-room and detracted from the architectural appearance of the building. On the basement floor are located the feeder and tie cable outlets, regulators and field rheostats. On the next floor a busbar and oil-switch structure are installed, and on the third floor, which is about 5 ft. above the turbine-room, are located the operating switchboard, offices for the station staff and a storage-battery room, the equipment of the latter being used to operate the main oil switches of the plant, which are of the solenoid type. The switch house is separated from the turbine-room by a fire wall into which are set windows of clear, wired glass, and a similar partition separates the office of the chief engineer from the turbine-room.

The operating room contains two switchboards, installed opposite each other, one being for generator and the other for feeder service. The generator board contains eight slate panels and is 13 ft. 4 in. long. The feeder board is of the same material and contains seven panels, having a total width of 11 ft. 8 in. Two sets of 2400-volt, three-phase busbars are provided, and any generator may be connected to any bus or any feeder or tie circuit may be run off either busbar.

No high-voltage line enters the operating room, the entire service being of the remote-controlled type. Each generator panel contains a Weston ammeter and power-factor indicator, voltmeter, field ammeter and switch, watt-hour meter, polyphase wattmeter, governor-control switch for turbine synchronizing, field rheostats, oil-switch control for the main alternator, push-button signal system connecting with each turbine, and pilot lamps showing the position of main switches. On a swinging bracket at the end of the board are installed a voltmeter for each busbar set and a machine voltmeter and Weston synchronizing indicator. Shunt and series instrument-calibrating terminals are installed on each generator panel. A single-stroke signal bell is installed on the generator board in connection with the turbine-operating service, energy being supplied from the battery supplying energy to the oil-switch solenoid coils. The battery consists of fifty-five cells of the chloride type mounted in glass jars in an acid-proof room at the side of the switchboard-room. An air-whistle installation, operated by an electromagnet controlled from the switchboard, is in service in the turbine-room. The battery supplies energy also to an emergency lighting circuit serving various parts

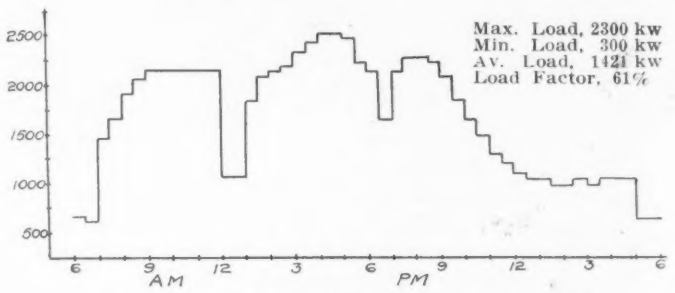



Fig. 11—Output in Kilowatts on April 14, 1911.

of the building, operates the governor control, field rheostat, motor equipments and solenoids. The auxiliary direct-current service is operated at 110 volts and the auxiliary station motor and lighting services are run at 240 volts and 120 volts respectively. The regular lighting service is supplied through a 25-kw transformer and the motor service through a 50-kw three-phase transformer installation. In common with the tie and feeder lines these may be connected to either 2400-volt busbar set by a remote-controlled oil switch. In addition to the generator panels, the generator board contains a Tirrill regulator panel, also equipped with turbine-room signal buttons, frequency indicator and shunt instrument-calibrating terminal; a battery panel equipped with circuit-breaker, ammeter, reactance used in connection with the rectifier outfit which is employed in charging the battery, various auxiliary switches and two exciter panels. The battery may be charged from the exciters if desired, and energy from the exciters is used to operate the engine-room crane, which is a 50,000-lb. Maris outfit equipped with operator's cab and trolley hoist. The exciters are of the interpole type, each being rated at 100 kw and delivering energy to either a pair of main or a pair of auxiliary busbars at 125 volts.

The feeder switchboard contains two panels controlling the tie lines between the plant and the Faraday Street substation, two incandescent-lighting panels for future service and three motor panels to be utilized later. Each tie line is provided with an ammeter, watt-hour meter, inverse-time-limit relay, oil-switch control, pilot lamps, shunt and series instrument-calibrating terminals. Line-drop compensators are also installed and adjusted to maintain a constant voltage at the Faraday Street busbars regardless of the load changes within the adjustment range. The feeder panels contain the usual complement of ammeters, voltmeters, contact-making voltmeters and inverse-time-limit overload relays, with full provision for remote control. The outgoing lighting circuits will be controlled by motor-driven feeder regulators installed in the basement, but the future motor circuits will be run directly from the busbar oil switches to the centers of distribution. Both the switchboards, with their auxiliary switching equipment, were installed by the General Electric Company, which also furnished the apparatus utilized in connection with the distribution service at the Faraday Street substation.

At Faraday Street each incoming cable is brought into

the substation basement through cable potheads and selector switches, and thence to a pair of oil switches of the automatic, solenoid-operated type. Either switch when selected by remote-control operation from a switchboard in the old generator room of the station delivers energy to a corresponding three-phase busbar set, the busbars being installed in fireproof compartments in the basement. Each incoming line is rated at 1000 kw. Each outgoing feeder circuit may be connected to either set of busbars by remotely controlled oil switches located in compartments built of concrete sides and bottoms and slate tops, installed in the basement. In this installation the oil-switch relays are mounted on the angle irons of the switches themselves, instead of being located at a distance, with the result that inspection, adjustment and repairs are greatly facilitated. One man can easily attend to a switch since the location of the relay close by renders it unnecessary to depend upon a second attendant at the switchboard in the operating room upstairs.

The oil-switch solenoids are operated by means of energy from a fifty-five-cell storage battery, which is charged through a mercury-arc rectifier. Each incoming line is equipped with an inverse-time-limit relay, pilot lamps showing the condition of the line and additional lamps showing the open or closed status of the controlling switches, control relays, synchronizing connections and the usual series and shunt instrument transformer equipment. An edgewise-type Thomson ammeter is also inserted in each incoming circuit, with operating connections between the series transformers and switchboard panels. Only three panels are needed to control the incoming lines, the distribution being effected by a remotely controlled installation which has been established at the former alternating-current distributing switchboard in the operating room. A Hartmann-Kempf frequency indicator has been installed on the busbars of the distributing board, the instrument being supplied by Machado & Roller, New York. From Faraday Street eight lighting feeder circuits, two three-phase motor, four commercial arc, five direct-current, 500-volt and twenty municipal arc circuits are run into the company's territory. The arc-lighting system consists of 900 magnetite units of the 4-amp size supplied with energy through mercury-arc rectifiers and constant-current transformers. The details of the arc-lighting system were given in the issue of Sept. 5, 1908.

At present there are in operation at Faraday Street two synchronous motors, one of 800-hp rating and the other of 750-hp. The larger motor is mounted on a line shaft in the basement and drives two Brush arc machines and a 300-kw, 100-volt direct-current generator delivering energy to a limited motor-service clientèle. The Brush machines supply energy to commercial arc-lighting customers. The larger direct-current machine carries the greater portion of the day direct-current motor load, the smaller unit being run alone at night. The synchronous motors are directly beneficial in maintaining a high power-factor on the system as a whole, the company being able to secure between 95 per cent and 100 per cent without difficulty. A typical daily load curve of the Webster Street plant is given herewith, the load-factor averaging 61 per cent on the day shown, with a maximum load of 2300 kw and a minimum load of 300 kw.

The foregoing work has been completed under the administration of President George T. Dewey, the other officers of the company at that time being: Treasurer, Mr. H. H. Fairbanks; superintendent, Mr. William H. Coughlin, and assistant superintendent, Mr. Fred H. Smith. As noted in our issue for May 25, Mr. Smith is now superintendent, Mr. Coughlin having resigned.

The plans of the Webster Street station were prepared and the purchasing and installation of the equipment were in general handled by Westinghouse, Church, Kerr & Company, New York.

## GASOLINE-ELECTRIC TRACTION IN EUROPE.

By Francis E. Drake.

MUCH progress has been made in the past four or five years with the simplest form of gasoline-electric vehicle for railways and tramways. The most notable installations of gasoline-electric cars—generally termed "automotrices"—have been in Hungary. Successful installations are also recorded from Germany, Holland and France. England and Sweden have already placed important orders for the automotrice, which bids fair to take an important position in the European traction field.

Several European countries have already gained experience with steam motor-cars, which, in the beginning, seemed to offer a solution as a substitute for small locomotives and trains. The steam motor-car was found unsatisfactory, chiefly because of difficulties with the boiler. Moreover, the heat in summer and the presence of smoke and dirt annoyed the traveling public. The remarkable development and rapid improvement of the automobile type of gasoline motor led many to the conclusion that this type of engine could be used successfully for railway motor-cars. It was only after an expensive experience as to maintenance that the mechanically coupled motor-car was practically retired as being unable to meet the conditions for modern short distance or intermediate passenger traffic.

Nearly twenty years ago the first practical attempts were made with the gasoline-electric cars, in which, as a rule,

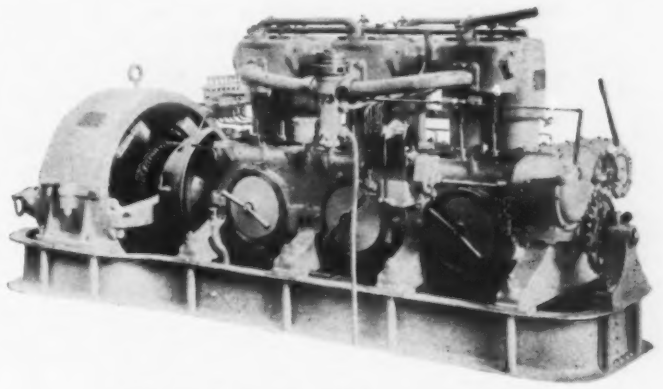


Fig. 1—Gasoline-Electric Generating Set.

the storage battery was an important part of the equipment. The system was found unsatisfactory and abandoned because of the heavy cost of maintenance, car weight and complication. The gasoline motors at that epoch were crude and unable to give continuous service.

Passing briefly the various stages of experiment and disappointment which mark the record of all industrial enterprises, it is important to note that the present success of the gasoline-electric automotrice on many European lines, operating under widely varying conditions, can be attributed to:

1. The reduction of motive power and of auxiliary equipment to the simplest elements, i. e., gasoline engine, direct-connected generator and secondary motors on the axles.

2. Reduction of total car weight to the lowest possible minimum for safety and security.

The solution of this type of traction in Europe has been arrived at by a route almost diametrically opposed to that accepted by American railway engineers, where the influence of the Master Car Builders has been opposed to the light car. Their specifications have required a double-truck Pullman type sufficiently heavy to be coupled with any existing rolling stock. The inevitable result has been that the railway motor-car in the United States has been a self-propelling Pullman. The total weight of the car has averaged from 40 tons to more than 50 tons.

Naturally if a speed of 25 miles per hour to 40 miles per

hour is required the power equipment, comprising engine, generator, motors, etc., must be correspondingly heavy. With a seating capacity of forty to fifty passengers the dead weight of the train becomes the equivalent of 1 ton per passenger. The European attitude toward this problem has been, in principle, to admit that the automotrice is useful in developing business on new lines or where

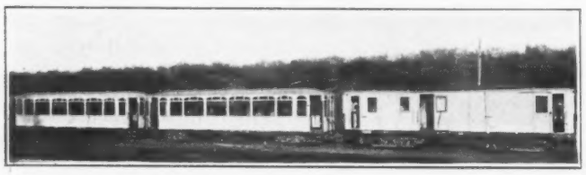


Fig. 2—Gasoline-Electric Train on Dreibergen-Arnhem Line, Holland.

traffic is sparsely centered and, consequently, very expensive if conducted by steam trains, or as feeders for trolley and steam-train business. Instead of 1 ton train weight per seated passenger, as obtains with the M. C. B. standard American railway motor-car, the European automotrice has but half this weight and in some cases less. Lower train weight means smaller and lighter engines, generators and motors, and consequent reduction in the operating costs.

A significant and important consideration in the size of the gasoline engine is that the nearer these units are kept to the well-developed automobile motor standard the more certain and reliable are the operating results. The larger high-speed gasoline engines have difficulties in cylinder cooling, lubrication, etc. There is also a greater danger from vibration, which, when communicated to the body of the car, is found objectionable by the passengers.

In general, it may be stated that according to European practice an automotrice capable of seating forty passengers will weigh not to exceed 20 tons. The power equipment may be either a 60-hp or a 90-hp engine and generator group, which, with this weight, will give a speed on the level of 25 miles per hour to 40 miles per hour.

Among the notable installations of automotrices in Europe is the Arad Csanad Railway, in Hungary, which is the largest and most important of the privately owned railways of that country. The company operates nearly 400 km (250 miles) of standard-gage line and has in operation more than forty automotrices. This company has been one of the pioneers in the adoption of the railway motor-car, its experience beginning over six years ago with the steam motor-car service. This was succeeded by a car driven by a gasoline motor from which the power was communicated to the axles through mechanical transmission, such as is common with the automobile. Both of these systems were finally discarded and replaced by the simplest form of gasoline-electric automotrice designed and executed by the Société Anonyme Westinghouse. In the course of four years the passenger traffic of the Arad Csanad Railway, which now aggregates more than 1,500,000 passengers per annum, has been entirely converted to automotrice service. The commercial results have enabled the company to reduce the fares one-third and increase the number of passengers carried threefold. The passenger traffic of the line, which formerly under small locomotive traction gave a loss of $40,000 per annum, now produces a net profit of $100,000 per annum.

Two forms of automotrice trains are used—the slow or "omnibus" trains with frequent stops and limited speed and the express service, comprising, according to traffic conditions, one automotrice and one or more trailers. The express trains make a speed of 40 miles on the level, although the commercial schedule speed is probably 25 miles per hour.

Another interesting installation has been carried out on the lines of the Oosterstoomtram in Holland. This line is approximately 50 km (31 miles) in length with 1067-m gage. The line extends from Dreibergen, near Utrecht, through Rhenen on the Rhine, to Arnhem. Until 1909 this line was operated with steam locomotives. Owing to the composition of the trains, following the government regulations, the Oosterstoomtram decided to use automotrice locomotives which could also serve as baggage and postal cars. The light passenger cars which had formerly been hauled by steam locomotives serve as trailers for the automotrice locomotives. (See Figs. 2 and 3.)

The automotrice locomotive comprises separate compartments for the mails and baggage. The gasoline engine and generator are installed in the center of the car. The total length of the chassis of the automotrice is 10.8 m (35.24 ft.) and the width of the car body 1.9 m (6.21 ft.). The power equipment consists of a six-cylinder, 90-hp Westinghouse engine and direct-current generator. In the power compartment are the gasoline and water tanks. The radiator is placed on the roof of the automotrice and the cylinder-cooling water is made to circulate through same. In the driving cabins, at either end of the car, are placed an operating controller and a lever for the regulation of the driving group, indicating instruments, circuit-breakers and the air-brake lever. The weight of the automotrice locomotive is 18 tons, and will ordinarily haul two bogie trailers, each weighing 11 tons empty. The train, with passengers, will therefore weigh 40 tons and contains seating capacity for 100 people.

During the trials one of these automotrice locomotives started a train of 71 tons of construction material on a curve of 18 m (59 ft.) radius, followed by another in the opposite direction of the same radius. This train was hauled at an average speed of over 10 miles per hour from Dreibergen to Sandenberg, a distance of 6 miles. The line between Dreibergen and Arnhem has curves with a maximum of 3.7 per cent and 3.2 per cent for a distance of 1000 ft. and 3500 ft. respectively. There are many curves with a radius of 20 m (6.56 ft.). The automotrices actually in service on these lines make from 80 miles to 100 miles per day. Owing to the presence of several steam trains the commercial speed of the automotrice train cannot exceed 10 miles per hour. Much of the line lies through villages and well-settled communities where frequent stops must be made, there being 170 stops during a day's run. The average consumption of gasoline per train-kilometer, density 0.765, is 800 grammes, and for gasoline of a density of 0.715, 750 grammes. Naturally the consumption of gasoline will vary according to the speed of the train and the number of stops.

Another interesting installation of an entirely different character is the automotrice on the tramway line, Dinard & St. Briac, in France (Fig. 4). The line in question,

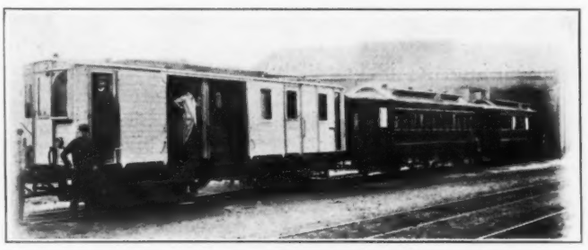


Fig. 3—90-hp Gasoline-Electric Locomotive, Oosterstoomtram, Holland.

which passes through the town of Dinard and connects with other summer-resort localities, has a total length of about 6 miles. The automotrice chosen by the company seats thirty-seven passengers, first and second class, and is equipped with a 90-hp generating group (Fig. 1). Formerly the service was secured entirely by small steam locomotives, but the demand of the public for improvement in

the service and comfort caused the adoption of the automotrice. Owing to the fact that the passenger traffic exists only during the four or five summer months, an electric trolley installation on account of its heavy first cost was considered out of the question. The Dinard automotrice weighs, with passengers, 22 tons. Following the schedule in operation for the steam trains the automotrice makes a

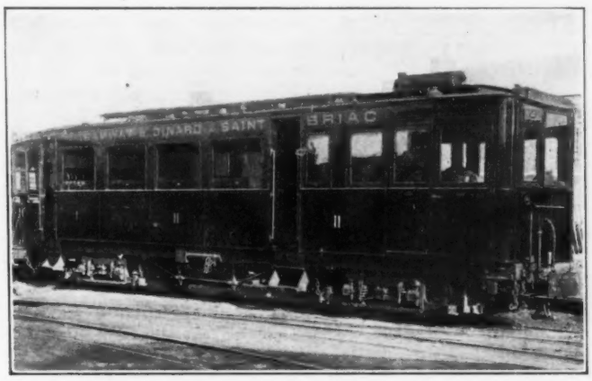



Fig. 4—Gasoline-Electric Car for the Dinard-St. Briac Railway.

daily run of 74 km (45.8 miles), with seventy-nine stops, and consumes, including switching, a total of 56 kg 250 gr (125 lb.). Until the steam locomotives are all replaced the old train schedule must be maintained.

One of the recent installations of the automotrice in France is on a private railway connecting the Mines de Carvin with the Chemin de fer du Nord. The automotrice train, comprising automotrice and one trailer, with passengers weighs a total of 39½ tons (Fig. 5). The consumption of benzol (produced by the mines as a by-product from coke ovens) is 423 grammes per train-kilometer, not including stops and switching. The trains make an average of 65 km (40 miles) per day with thirty-three stops. The total consumption of benzol per train-kilometer is 570 grammes, indicating that the combustible consumed in stops, switching, etc., amounts to practically 25 per cent. Previous to the installation of the automotrice the small steam locomotives used on this line consumed 1¾ tons of coal briquets per day. The mine estimated the value of the briquets to be 18 francs per ton. The saving in fuel on the basis of 64 kg 500 gr of benzol per day at 16.77 francs against coal at 31.40 francs used in the locomotives amounts to approximately 50 per cent, to say nothing of the saving of firemen's wages, etc., and maintenance costs.

In Germany the Oestdeutsche Eisenbahn Gesellschaft

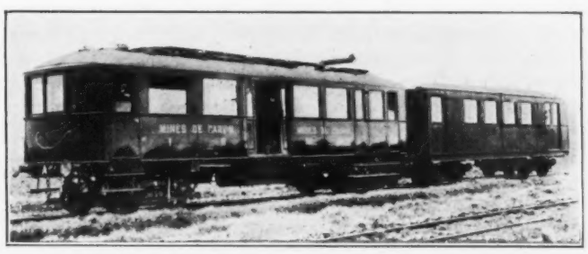


Fig. 5—Motor-Car and Trailer on the Mines de Carvin Railroad.

adopted the automotrice of 60-hp capacity for a line 55 km (34 miles) in length with maximum grades of 1.6 per cent. During the past three years three trips per day constitute the average run. The commercial speed is about 18 km (11.2 miles) per hour.

In nearly every country in Europe the government regulations concerning railway material are more or less stringent and follow a certain long-established practice. The introduction of the automotrice is sometimes effected with difficulty with the government inspectors, who have the control of such rolling stock. The types and general finish of car bodies also follow certain prescriptions which have in many cases been adopted by the governing authorities. Having struggled against earlier failures, born of unripe experience and unreliable elements, the gasoline-electric automotrice has finally established for itself a sure and rapidly growing popularity.

## COMPARATIVE THERMAL TESTS OF AN ELECTRIC FIRELESS COOKER.

By Albert A. Somerville.

THE use of an electric heater with a fireless cooker would seem to give the highest possible efficiency for the electrical heater, by confining the heat in one place and thus raising the temperature to a higher mark and holding it there, for a given time rate of supplying electrical energy. The net efficiency of the thermal box or fireless cooker would also be increased for the reason that if a hot body is placed in a cold hay box, or whatever material is used for heat insulation, everything surrounding the hot body must be warmed up to nearly its temperature. To do so the hot body itself must give up some of its heat, and in so doing its temperature will drop some degrees before a temporary thermal equilibrium is established throughout the box. On the other hand, if instead of placing a hot body in a cold box, a cold body be put in a cold box and the

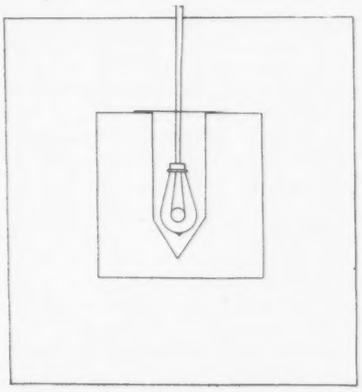


Fig. 1—Experimental Fireless Cooker.

cold body heated by an electric heater, then it is true that some heat will be lost by the body before it is brought to the desired temperature, but the heat that passes out of the body goes into the surrounding heat-insulating material and warms this material adjoining the inside body to the same temperature as the body itself, so that the total amount of heat supplied is made useful.

Laboratory experiments were made by the author along the above lines extending over a brief period of a few weeks. With the exception of some electrical measuring instruments the apparatus used was of the crudest kind. The fireless cooker was made of a wooden box which had been constructed originally for packing a typewriter for shipment. The dimensions of this box were 17 in. x 17 in. x 15 in., the thickness of walls being from ½ in. to ¾ in. Different heat insulations were used—sheep's wool, sand, paper and asbestos such as is used in incasing large steam pipes. In the center of this box, supported on glass rods, was placed a tin bucket 8 in. in diameter and 8 in. high. A hole was cut in the lid of the bucket in order to admit an electric heater into the very middle of the body to be heated. This hole was made large enough to admit an incandescent lamp, as it was intended to try one of these as a possible heater.

A cylinder of tin to incase the heater was fastened onto the cover so as to extend down into the bucket. A cross-section view of the outfit would look somewhat like Fig. 1.

In order to get quantitative results a known amount of water was heated each time. Use was made of an automatic recording thermometer consisting of a coil of copper wire connected to an automatically balancing Wheatstone bridge. The resistance of the copper coil being a known function of the temperature, the Wheatstone bridge became a temperature-reading instrument and by means of a chronograph attachment it was made to draw a time-temperature curve.

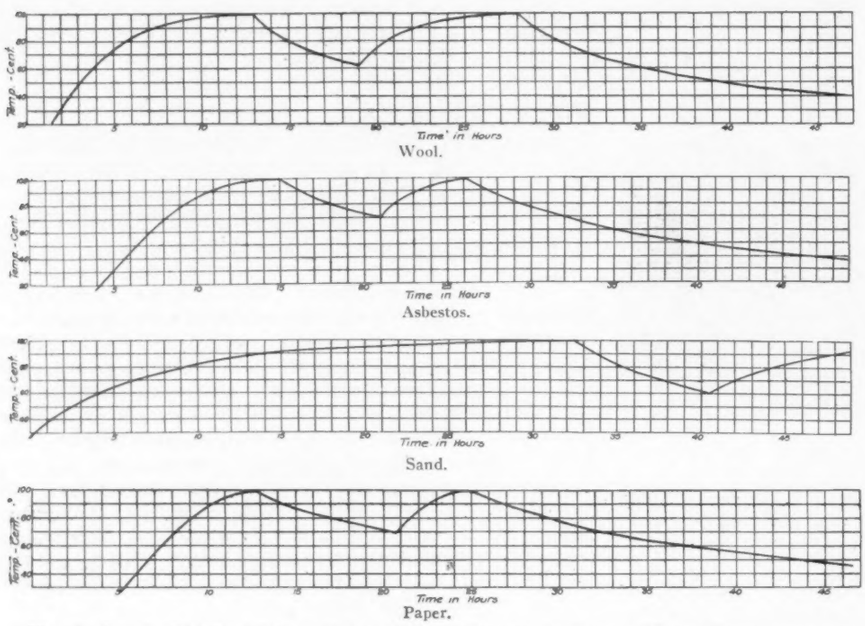



Fig. 2—Curves Obtained When Using Wool, Asbestos, Sand and Paper Respectively as Heat-Insulating Material.

The results for four insulating materials are shown in the accompanying curves. A 16-cp carbon lamp was used as the heater. It was run on a 110-volt circuit and drew approximately 0.5 amp. Knowing the amount of water used, which was 1 gal., and the mechanical equivalent of heat, one can easily estimate the rate at which the temperature of the water should rise if there were no loss of heat whatever. It is found that almost 5 minutes is required to raise the temperature 1 deg. C. If then the temperature is to be raised from, say, about 15 deg. C. (tap water) to the boiling point, then under ideal conditions approximately seven hours of time and 385 watt-hours of energy would be required. In reality it will take a much longer time than this ideal minimum, for the reason that the whole surroundings must be heated to some higher temperature and also from the fact that some of the heat generated passes entirely out of the inclosure and is lost. Moreover, the longer the time required for heating the greater the loss becomes, and hence for practical purposes it would be better to use a larger energy flow and heat the inside body more quickly so as to reduce the time element in which heat loss occurs. For this purpose use may be made of a heating unit consisting of a non-oxidizing wire, of which there are now several alloys on the market, and after the desired temperature is reached a small lamp may then be used instead of the first heater, in order to hold the temperature at some desired point. A thermostat such as was described in the *Electrical World* of Jan. 12, 1911, may also be used to control the temperature; this may be set at any temperature so that it will cut off the energy supply when the temperature goes above that point and make connection again when a certain lower temperature is reached.

One way of stating the efficiency of such an apparatus would be the expression $A \div B$, where $A$ is the minimum amount of heat necessary to bring the inclosed body to the desired temperature and $B$ is the actual amount of heat used in attaining the desired temperature in any particular case. If $B$ is equal to $A$, then the efficiency would be 100 per cent according to this definition, which ideal condition is not reached or expected. The efficiency at any temperature may be expressed as the ratio of the amount of time required to change the temperature 1 deg. under ideal conditions to the actual time required to change 1 deg. at that temperature. In the case of each test here recorded the bucket containing the water and heater was buried in the middle of the box by packing on all sides with the particular heat insulator then being used. In one case the box was filled full of sand that had been stored in a barrel for a month but was not yet perfectly dry. The weight of it was considerable, the volume shrinkage about 5 per cent as it dried and the heat loss by conduction large while in this moist condition.

The method of procedure was to obtain data for points on a heating curve until the water was brought to the boiling point or until the energy supply was turned off at night, and then to allow the mass to cool, the cooling curve thus obtained showing its action as an ordinary fireless cooker would cool. The temperature-recording apparatus was run continuously by means of storage batteries. The heating curve was again begun as soon as the supply of energy from the station was restored in the morning. Incidentally this temperature record shows at just what time the energy was turned on and off at the plant.

It was necessary to support the bucket of water on glass rods when wool and asbestos were packed around it in order to keep it from sinking to the bottom. The wool was torn apart into fine particles and packed in loosely. It was dry, but slightly oily. The results would probably have been better if the oil had been entirely removed. The asbestos was originally in the form of steam-pipe casings, but was entirely pulverized so that it packed easily into all the available space. The sand became perceptibly warm all around the outside edges. No heating whatever could be felt by the hand at the surface of the wool, wool being a poor thermal conductor. A thermometer inserted into the wool a short distance at various places and left quite a while would, however, show an increase of several degrees of temperature. The asbestos was slightly warmed at the surface in only one place just above the bucket of hot water.

Newspapers used for insulation were wrapped round and round the bucket, the bottom of the containing box being thickly covered with them, the space between the walls being well filled and the top also covered with several layers so as to make the thickness as nearly as possible the same as that used in the other cases. The accompanying curves show that paper insulation gives the highest efficiency. The slope of the heating curve is larger and that of the cooling curve smaller than for any other insulator, thus indicating the highest efficiency. Anything that will prevent air currents and alternate with air to make many layers or coverings will provide good heat insulation. Of course, newspapers could not be used at very high temperatures owing to

danger of becoming ignited. For all domestic purposes they are, however, probably entirely safe.

As a summary, then, it may be said that for moderate temperatures an electric fireless cooker may be used advantageously, and that the highest efficiency is attained where newspapers are used for heat insulation and the heater consumes enough power to reach the desired temperature in a short time and thereby minimizes heat losses.

## A. I. E. E. PAPERS AND DISCUSSIONS.

The following are the remainder of the papers presented at the recent Chicago convention of the American Institute of Electrical Engineers, together with abstracts of the discussions to which they gave rise:

### SINGLE-PHASE MOTORS FOR HEAVY SERVICE.

Mr. E. F. W. Alexanderson, of the General Electric Company, read a paper in which were recorded the results of investigations relating to the use of polyphase motors upon single-phase circuits. The method described represents a modification of the scheme of using a previously operating polyphase motor receiving energy from a single-phase system to supply polyphase voltage to another motor which is to be brought to full speed from starting conditions. As ordinarily applied this method provides polyphase voltages that are far from being balanced, and hence the result has not always been satisfactory.

The author shows a method by which the phase displacement can be corrected in order to obtain approximately balanced polyphase voltages. A two-phase motor is operated without load as a phase-converter to supply two-phase voltages to the system. This machine acts like a series transformer between one phase and the other, to transform the current from one line to the other, and displace it by approximately 90 time degrees. In order to make this arrangement effective the author has interpolated in the idle phase of the phase-converter a voltage derived from the single-phase line, so as to create artificially a phase displacement between the output of the phase-converter and the input of the motor.

The author remarked that this method of operating two-phase motors appears particularly to advantage when a single-phase converter can be used to furnish quadrature voltage to an aggregate of several motors. He remarked that designs have been made for a phase-converter having an output corresponding to 1600 motor hp. He estimated that the total increase in the weight of the electrical equipment for single-phase power would be 15 per cent over the corresponding polyphase equipment with the same output and starting torque.

### ELECTRICAL OPERATION OF THE WEST JERSEY & SEASHORE RAILROAD.

The author of this paper, Mr. B. F. Wood, gave data on the electric road operating between Camden and Atlantic City, N. J. This branch of the Pennsylvania Railroad was formerly operated by steam, but no comparison is made with the operation of the parallel steam service and no attempt is made to analyze or compare the data with any heretofore presented on the subject. The road was described in these columns shortly after it was placed in operation. (See *Electrical World*, Nov. 10, 1906.) It is 64.6 miles long and operates on the multiple-unit, 675-volt, direct-current system with an over-running third-rail. There are a single generating station 5.6 miles from the Camden terminal rated at 8000 kw and eight substations equipped with six-phase synchronous converters. The paper is replete with data taken direct from the operating records with only such additions as would make them more readily understood. No effort has been made to curtail or to modify in any respect the data selected. After giving the entire equipment of the road in detail the author appends in tabular form its cost of construction, the unit cost of electrification, cost of operation and maintenance, detentions to train service and causes, renewal of parts of car equipment, gear and pinion breakage and certain general power data of interest. This latter statement shows the kw-hour output from the generating station, the cost in mills per kw-hour output, pounds of coal burned per kw-hour and the efficiency of transmission and conversion from the alternating-current bus in the generating station to the direct-current bus in the substations. Improvements are noted in each of the four years of operation, the cost of energy and the coal consumed per kw-hour decreasing with each successive year from 6.8 mills and 3.67 lb. respectively in 1907 to 5.42 mills and 3.25 lb. respectively in 1910. The data are valuable for comparison with other systems and as a matter of record.

### ANALYSIS OF TRUNK-LINE ELECTRIFICATION.

A paper entitled "Electrification Analyzed and Its Practical Application to Trunk-Line Roads, Inclusive of Freight and Passenger Operation," presented by Mr. W. S. Murray at a meeting of the American Institute of Electrical Engineers held at Toronto, Can., on April 7, 1911, was presented in review for discussion. An abstract of this paper was given in our issue dated April 13, 1911.

In expounding his long paper, Mr. Murray said that its object was to present the results of six years' work with single-phase electrification. There are three classes of railroad locomotives, passenger, freight and switching, and the speaker said that electric locomotives are replacing steam locomotives for all three. Electrical engineers must not talk one system exclusively; they should have a sense of standardization on the general principles of using electricity for heavy trunk-line railroading, including terminal and suburban traffic. Freight traffic cannot be considered for electrification without considering the yards problem. On the Eastern roads the yard mileage is perhaps 50 per cent of the main-track mileage on a freight basis. Mr. Murray cited the Harlem yards of the New York, New Haven & Hartford system to show that the overhead catenary construction for single-phase operation enables the electrification of terminal yards to be made at one-third of the cost of any other system. Moreover, this system of distribution is less expensive for main-line construction than any other. The weight and cost of equipment for single-phase operation were serious at first, but both of these items are being reduced.

*Discussion.*

Mr. Frank J. Sprague, of New York, chairman of the Institute railway committee, opened the discussion. He recalled his inaugural address as president of the Institute at the Chicago meeting of 1892, when he chose electric-railway possibilities as his subject. He said that he would change the conclusions then advanced only in a few particulars at the present time, and he quoted from that address. There are those, he said, who think there is a mean between alternating-current and direct-current employment for railway operation. Some think that the direct-current motor possesses advantages to be united with alternating-current transmission by the rotary-converter transformer or the motor-generator. This is a safe and conservative attitude. There are others who would add alternating-current distribution. The experience of the New Haven road with single-phase has not changed the speaker's opinion of several years ago.

The general subject of railroad electrification should be discussed as a question of steam versus electricity, based on known operatingcosts. It is unwise to discuss this or that system, but best to get actual facts from existing systems. Single-phase development has promised much and disappointed much; the history of single-phase operation on interurban roads has been most unsatisfactory. As to trunk-line systems, the railroad people have shown extraordinary reluctance to give actual results of operation. This ap-

plies also to the cost of producing electrical energy by railroads, although such cost is well known in other electrical enterprises. Only a few of the railroads having generating plants have made direct comparisons of the cost of energy, considering steam and electricity. Mr. Wood's paper on the West Jersey road sets an example which other roads should follow. The thanks of the railway committee and the Institute are due to Mr. Wood and his company for the perfect frankness exhibited. One comment that may be made on this paper is the rather wide variation in the cost of operation per car-mile compared with the comparatively slight variation in the cost of energy delivered to the contact shoes. This, however, is influenced by the demands for electricity for lighting and heating.

Mr. Murray's paper was criticised by Mr. Sprague as a specious plea for a pet system. It is as though the single-phase advocates say, "We've made it work, now let's make it pay." The speaker noted that it was proposed to abolish the 25-cycle motor and substitute induction motors or even direct-current motors. However, other European and American engineers recommend 15-cycle operation. The speaker declared that every wheel in the electric zone of a railroad system should be operated by electricity; the diversity factor should be extended in railway work as well as in central-station service. The day of individualization in railroading will pass. The railroads' demands for energy will be met by great central stations. The New York Central terminal system in New York could be better supplied to-day by a central station like that of the Commonwealth Edison Company of Chicago.

Referring to the Chicago electrification situation, Mr. Sprague said that when electrification comes in that city the engineers will see the maximum benefit to the railroads and the community with the minimum burden. This means polyphase transmission and direct-current distribution. Referring to the storage-battery question, the speaker said the New York Central put in batteries because of the absolute necessity for insurance and not to reduce the kw-hour cost. In conclusion, Mr. Sprague said, "Let it be a battle between steam and electricity. I stand against that attitude which compares the promises of one electric system with a denial of the possibilities of another."

Mr. E. B. Katte, of New York, also praised Mr. Wood's paper. He noted in it a much larger number of detentions on the trolley part of the system than on the third-rail part. In relation to Mr. Murray's paper, Mr. Katte read a written communication in which he said that he believed that any steam railroad could be equipped reliably either by the single-phase, polyphase or direct-current system. Not one of these systems is entirely satisfactory by itself. The question is, Does electricity effect saving enough to meet the additional fixed charges? As a matter of fact, electrical operation of trunk-line railroads is more or less of a luxury or installed to meet some special condition, as in terminals or tunnels. If the steam locomotive is abolished as a nuisance in cities, the cost of electrification should be shared by the city or state, as in the case of the abolition of grade crossings.

Referring to the New York Central direct-current operation and the New Haven single-phase operation, Mr. Katte said the saving in energy consumption on grades is in favor of the direct-current locomotives. The record shows less interruption to train service on the direct-current system than where single-phase is used. Mileage records were also compared, to the advantage of the direct-current system, and the speaker also declared that reliability of electrical operation is not peculiar to the single-phase system. He pointed out the economical effect of batteries in equalizing load on power stations. Successful electric locomotives should not only be reliable, but of low maintenance cost, and here the direct-current machine seems to have an advantage. The first cost of the direct-current locomotives appears to be less also. Mr. Katte believes that the conclusions of Mr. Murray's paper are not justified. However, his purpose is not to urge direct current as opposed to single-phase current, but to point out that so far the former has made the better record. Both systems are available, however, and the selection should be left to the requirements of each specific case.

Mr. L. C. Fritch, of Chicago, spoke from the viewpoint of a steam railroad engineer. He made the interesting disclosure that he had prepared a paper on the subject at one time which was, however, suppressed by steam-railroad men as being pro-electric. Mr. Fritch believes that there is no work in heavy trunk-line service that the electric locomotive cannot perform more efficiently than the steam machine. Railroad men are making a mistake in warding off something that is inevitable. The Mallet type of locomotive was referred to as the last gasp of the steam locomotive, and compared with the electric locomotives used in the Pennsylvania terminal in New York City to the advantage of the latter. The question of electric systems must be established. Controversy furnishes ammunition to steam railroad advocates. In Chicago, for instance, how could one company adopt one system and another another system and interchange traffic? The speaker favored a universal system, and said that one could be reached. Electrical engineers should cease battling for rival systems and adopt a standard. In Chicago it will be contended by steam railroads that it would cost $250,000,000 to electrify the railroad terminals. However, the entire terminal situation should be revised, and there should be electrification within a certain reasonable limit. Mr. Murray's point about the electrification of yards was praised. A very important point is that the number of switching locomotives may be reduced by using electricity. Mr. Murray's paper has demonstrated the feasibility of electrifying large freight terminal yards.

Mr. J. L. Woodbridge, of Philadelphia, took issue with Mr. Murray on the battery question. He believes that the storage battery properly installed is a profitable investment, and cited the case of the Chicago City Railway Company in connection with the contract made with the Commonwealth Edison Company. Here the battery shows a return of 12 per cent on the investment. Trunk-like service is still more favorable to the storage battery. The advantage of developing energy at minimum cost rather than under conditions of maximum cost was pointed out. However, it is not economical for the battery to take all peaks above or below an average load line.

President D. C. Jackson, of Boston, left the chair to take part in the discussion. He praised the courage and vigor of the New Haven engineers in working out a great alternating-current system. It seems to be proved that both alternating and direct-current systems will meet all conditions of railroading. The speaker pointed out that there could be standards even where there are different systems. Really the only open question is whether the improved service can be given without increasing the cost of service. The future can be viewed with equanimity, as the indications point in the right direction.

Mr. N. W. Storer, of Pittsburgh, praised Mr. Wood's paper, which he examined in some detail. He thought some of the speakers had gone out of their way to make an unfavorable comparison of the overhead trolley with the third-rail. There is a good reason for the greater cost of maintenance of the trolley wire. The use of a pantograph trolley will nearly wipe out the larger cost of maintenance with trolley wheels. Referring to Mr. Murray's paper, Mr. Storer said that he was not prejudiced in favor of the single-phase system, but perhaps some of the advocates of the direct-current system could not say as much. The latter have done little or nothing for the development of a single-phase system. The speaker agreed with Mr. Fritch

that there should be some standard system. He believes that single-phase operation offers superior advantages for the transmission of energy, especially in the means for collecting energy from the line. It can be applied to yard construction much better than the direct-current system of any voltage.

Single-phase locomotives have been criticised as heavy and expensive, and it is not contended that this type of machine is as powerful for a given weight as a direct-current locomotive, but progress is being made. Mr. Storer exhibited drawings of a new single-phase locomotive with four pairs of drivers, each surmounted by two motors. The combined weight of the two motors is less than that of one big motor. The control equipment has been simplified and the weight of the locomotive reduced to 116 tons, developing a tractive force of 40,000 lb., at a speed of 50 miles an hour. The speaker urged the "get-together" policy. "What's the use of fighting?" he remarked. Direct-current apparatus is reliable, but the question is whether it is adapted for the main propositions in electric railroading that are coming up.

Mr. J. W. Lieb, Jr., of New York, discussed power-house operation for railroads. The electric-service companies want this business and are not very much interested whether single-phase, three-phase or direct-current operation is used, provided they can supply the electricity. However, it is of immense importance to be able to interchange electrical energy with local sources of supply. Twenty-five cycle current was urged with this in view. Railroad companies should feel that they can purchase electrical energy at a price at least not to exceed what it would cost them to manufacture the electricity themselves. Great economic advantages inure in one electric service system supplying railway, lighting and industrial loads in great cities, both in relation to carrying the peak loads and in improved load factor. The storage battery is a vital necessity for continuity of service; it would be a practical impossibility to obtain the existing record of great cities in continuity of operation without batteries. The fact that the great central-station companies stand ready to furnish electricity to railroads at least as cheaply as they can make it should be an important factor in hastening the day of railroad electrification. The speaker concluded by praising the Commonwealth Edison Company of Chicago for being the leader in obtaining railway load.

Mr. C. F. Scott, of Pittsburgh, reviewed briefly the history of the subject. The manufacturing companies have done their part; the problem is now one of operation. Standardization should come as rapidly as engineers are sure of their ground, but leaving opportunity for development. The speaker declared that those who know most of the troubles of single-phase operation are loudest in singing the praises of that system.

In closing, Mr. Alexanderson said that alternating-current railway practice had been "tackled" the hardest way first. He felt confident that all of the traction work on the New Haven road could have been carried out by induction motors. Mr. Wood confined his remarks to the power-house end of the situation. Railroad companies do not want especially to build power houses. The West Jersey power house has a load factor of 16 per cent, whereas the Chicago central-station system, with its diversity of output, has a load factor of 45 per cent. Mr. Wood spoke favorably of railroads buying their electrical energy where it could be obtained as cheaply and reliably as in Chicago.

Mr. Murray replied to the criticism that some vital points were omitted from his paper by saying that because of the mixed steam and electric operation on the New Haven road, and further from the fact that both single-phase and direct-current are used, the figures called for are unavailable. It is not fair, he said, to point out the receiverships of certain single-phase interurban railroads, whereas no comment was made on the fact that other single-phase interurban systems are in satisfactory operation. The management of the New Haven Railroad, after trying the single-phase system, is willing to pledge $12,000,000 for extensions. As far as the case can be analyzed, the economies of single-phase operation will cover the interest on investment for electrification. Mr. Murray does not want to be understood as deprecating use of the storage battery. In many cases it should be installed. He pointed out that the direct-current system is thirty years old and the single-phase six years. He asked that the latter be given time to "make good." He also spoke of the economy of catenary overhead construction in freight terminal yards.

### COMBINED WIRE AND WIRELESS TRANSMISSION.

In a paper by Major George D. Squier, U. S. Signal Corps, entitled "Multiplex Telephony and Telegraphy by Means of Electric Waves Guided by Wires," a description was given of experiments relating to the combination of the present engineering practice of wire telephony and telegraphy with the engineering practice of wireless telephony and telegraphy. It has been found possible to superimpose upon the ordinary telephonic wire circuits now commercially used electric waves of ultra-sound frequencies, without producing any harmful effects upon the operation of existing telephone service. The experiments described were conducted between the small research laboratory at the Bureau of Standards and a small construction laboratory of the Signal Corps in Washington, separated by a distance of about 7 miles. Each of the laboratories is supplied with a wireless telephonic and telegraphic installation with suitable antennas. In addition, the laboratories are connected by a standard telephone line, which was employed in the experiments described.

Use was made of a special form of inductor alternator designed for 100,000 cycles per second and for an output of 2 kw. The alternator is provided with 600 armature slots cut in the radial face of the stator, and is wound with quadruple silk-covered copper wire 0.016 in. in diameter. The rotating inductor has 300 teeth on each side of its periphery spaced ⅛ in. between centers. The rotative speed is 20,000 revolutions per minute, and since the rotor has a diameter of 1 ft. the peripheral speed is 700 miles per hour. The machine develops about 150 volts with the armature coils connected in series. The machine is intended to be used with a condenser, the capacity reactance of which at 100,000 cycles balances the armature inductive reactance, which is 5.4 ohms.

The first experiments performed over the telephone line between the two laboratories were directed to the inquiry as to whether or not it is possible to superimpose upon the minute telephonic currents now employed in telephony over wires electric waves of ultra-sound frequencies, without causing prohibitive interference with the battery telephonic currents. It was found that alternating currents of frequencies ranging from 30,000 to 100,000 complete cycles per second, when coupled directly, inductively or electrostatically to local circuits from the generator, produced absolutely no perceptible physiological effect in the receivers. In actual operation various forms of detectors, such as are now used in wireless telegraphy, were introduced between the telephone receiver itself and the energizing circuit. Use was made of the regular forms of automatic interrupters, such as are now employed in wireless telegraphy, for modifying the continuous train of sustained oscillations from the generator into groups or trains the period of which falls within the limits of audition. The result was that, with the two additional and essential pieces of apparatus operatively connected between the telephone receiver and the generator, the energy of the generator was delivered to the ear in a form well suited for physiological effects.

The author described a large number of arrangements which were actually employed for carrying out the above-

mentioned method of superimposing the currents. He claimed that the experiments made indicate that either the existing wire system or additional wires for the purpose may be utilized for the efficient transmission of telephonic and telegraphic messages, the former without interfering with the existing telephone traffic on these wires. The fact that each of the circuits created by the use of superimposed high-frequency methods is both a telephonic and telegraphic circuit interchangeably makes it possible to offer to the public a new type of service which will possess many advantages for the commercial world. This type of circuit should be particularly applicable to press association service, railway service and leased-wire service of all kinds.

The author showed that the ohmic resistance of the wire can be made to play a comparatively unimportant part in the transmission of speech, and the more the phenomena are of the ether instead of those of metallic conduction the more perfectly will the modified electric waves, which are the vehicle for transmitting the speech, be delivered at the receiving point without distortion. He showed that the phenomena of resonance, which are encountered in so many different branches of physics, exhibit very striking and orderly results when applied to electric waves propagated by means of wires. The use of tuned electrical circuits at the receiving end readily admits electromagnetic waves of a certain definite frequency, and bars from entrance electromagnetic waves of other frequencies, thus permitting the possibility of utilizing a single circuit for multiplex telephony and telegraphy.

*Discussion.*

Dr. Frank B. Jewett, of New York, pointed out that in commercial practice complications would arise not found in Major Squier's simple circuit. He spoke of the attenuation of the energy with the very high frequencies proposed. In commercial plants a sufficient amount of energy must be delivered to give the customer audible speech in his receiver. To do this with the Squier method, using No. 8 gage wire and a circuit of 1000 miles, it would be necessary to put into the circuit from 4000 to 300,000,000 times as much energy as now required for commercial practice, if frequencies of 15,000 to 50,000 cycles be employed. Figures were given for other sizes of wire. The problem of applying the high-frequency method to existing wire plants would be an exceedingly difficult one. The speaker also referred to probable interference between different high-frequency circuits. It will be practically impossible to blot out inductive interference with any reasonable amount of tuning. Transposition would not be practicable. The question of signaling also presents a difficulty. Pupin inductance or loading coils are now used to increase the talking efficiency of telephone circuits. Every one of these coils would have to be bridged with a condenser if the high-frequency system were used. This necessity would again interfere with the practicability of the system. As a laboratory experiment the proposed method is a beautiful thing, but the speaker does not as yet see the answers to the objections which would arise in practice.

Mr. E. F. W. Alexanderson, of Schenectady, agreed that the frequencies proposed are too high to be used over wire circuits, although the mechanical means of producing such high frequencies can be supplied easily; but there might be hope for a frequency of 3000 cycles in multiplex telephony without distortion of wave shape.

Mr. S. G. McMeen, of Chicago (speaking for the author in the latter's absence), pointed out that telephone circuits are in existence to-day that are used entirely in talking and cannot be used for signaling. In considering the high frequency proposal, it must be remembered that the inductances and capacities would be of extremely small electrical dimensions. The important feature of the paper is its hope for development.

TELEPHONE TRAFFIC ENGINEERING.

Mr. F. P. Valentine, of the New England Telephone & Telegraph Company, presented a paper giving a discussion of certain phases of telephone traffic engineering based upon the result of studies made in the territory of the above-named company. The factors covered were quality of service, efficiency of labor, efficiency of operating methods, production efficiency of central office equipment, production efficiency of trunk and toll circuits.

The author stated that the essential qualities of telephone service are accuracy, speed of connection and uniformity in both speed and methods of handling calls.

About one-half of the paper was devoted to the production efficiency of trunk and toll circuits, which was said to be affected by the quality of service which it is desired to produce, by the efficiency of operating labor, by the efficiency of operating methods, to a certain degree by the efficiency of central office equipment, and also by the volume of traffic to be handled and the contract conditions under which the service is sold. In order to show the bearing of local conditions upon the engineering problems involved, a detailed study was made of a hypothetical case relating to two large offices 30 miles apart and four smaller offices situated at distances of 5 miles, 8 miles, 8 miles and 20 miles from one of the large offices. It was shown that when the traffic between the smaller stations and one of the large stations is placed on a "short-haul" basis, instead of having direct circuits between the various stations, the net result is a great improvement in the quality of service and greater economy in operating and in the use of equipment and circuits.

The author cited a case of 730 central offices, nearly every one of which formerly had its own separate toll position or toll board, although in the smallest offices the toll operation was handled in combination with the local. The method of operation having been changed, to-day the toll traffic between these 730 offices is handled at seventy-nine toll centers. The general effect on service has been to place all short-haul traffic on an approximately forty-second basis; to concentrate the longer-haul high-grade circuits in large groups between centers; to concentrate the long-haul toll operation at these centers, with the increased economy and efficiency of a larger and more highly developed toll force; to remove from the small offices the burden of labor entailed in handling toll calls, this resulting in a smoother local service and, through making available large groups of trunks on main routes, affording a more speedy, dependable long-haul toll service to all offices.

*Discussion.*

Mr. A. P. Allen, Chicago, spoke of the gradual determination of settled facts in the practice of telephone engineering. He gave the results of tests showing "peaks" in long-distance traffic. Curves were given also to show the guessing that has to be done on the ability of operators. It is hoped in the end to get accurate data on which to base fundamental plans in telephone engineering, but this stage has not been reached yet.

Mr. W. Lee Campbell, of Chicago, inquired if some mechanical device could be introduced between subscribers and operators by which the load could be distributed evenly between all the operators. Mr. Bancroft Gherardi, of New York, said that such a plan would require very exact cooperation of traffic and plant engineers. The question is a very interesting one, but at the present time the speaker fancies that the answer must be in the negative. There was some further discussion on this point, and Mr. Valentine closed by saying that telephone studies have reduced many things thought to be variable to well-known quantities. This work is carried on with increasing intelligence, and there has been great advancement in the last four or five years.

### TELEGRAPH TRANSMISSION.

The electrical characteristics of transmission systems of the closed-circuit Morse type were treated mathematically in a paper by Mr. Frank F. Fowle, of Chicago. In addition to discussing the fundamental features of telegraph transmission the author discussed the value of insulating resistance, the requirements of transmission, the design of relay, the general improvement in terminal conditions and improvements introduced in line insulation.

*Discussion.*

Mr. Bancroft Gherardi, of New York, praised Mr. Fowle's paper as one of the few presented in this country on the scientific treatment of telegraphic problems. The speaker referred to the design of insulators for telegraph and telephone lines and said that a suspended type of insulator has been proposed and is now under study. Copper-steel wire looks promising for use on important circuits. Prof. George D. Shepardson, of Minneapolis, also contributed briefly to the discussion.

### ORGANIZATION AND ADMINISTRATION OF A STATE UNIVERSITY.

Mr. Ralph D. Mershon, of New York, described a scheme of organization and administration designed for a State university, which follows closely the methods employed with large public-utility and industrial enterprises. He described the duties of the president, the secretary, the treasurer, university faculty, university council, alumni advisory board, the deans and college faculties. According to the scheme proposed the alumni advisory board would be clothed with a considerable amount of power, the suggestion being made that the membership of the board be drawn from those of the older alumni who have had wide experience and who previous to their election shall have stated their ability and willingness to attend faithfully the meetings of the board.

*Discussion.*

Prof. A. H. Ford, University of Iowa, thought the alumni visiting committee scheme, as outlined in the paper, not a workable plan, so far as it referred to the confirmation of appointments. Otherwise it was admirable. The budget plan recommended in the paper was to be commended. Professor Ford recited some defects in the present system of administering State universities. He deprecated political appointments on the board of trustees and outlined a scheme of organization in which the duties of trustees would be limited to some extent while the powers of the president were enhanced as compared with the Mershon plan. The paper neglected the social welfare of students, and Professor Ford outlined a plan for preceptors of dormitories, with a dean of such preceptors, or two in the case of a co-educational college.

Prof. C. F. Harding, of Purdue, regretted that the paper did not touch on the curriculum and the administration of a course of studies. The plan proposed would benefit the business conduct of universities, but would not better the output greatly. Owing to local conditions in different States it was difficult to see how a standard organization could be adopted for State universities. The speaker favored the co-operation of alumni, but proposed an alumni advisory board of four or five, instead of twenty.

Prof. B. B. Brackett, State College, Brookings, S. D., opposed an alumni advisory board in so far as it might become a controlling factor. Why should it be considered that alumni would have a wider view in educational matters than the college authorities?

Prof. A. S. Langsdorf, Washington University, St. Louis, thought the question would arise after reading the paper, Where is the faculty? The present-day college professor is no longer a scholarly recluse. In the scheme proposed the faculty was subordinated and the powers of the trustees, president and alumni were exaggerated The record of alumni in athletics had not been such as to lead university authorities to intrust them with great powers. Co-ordination of the work of college faculties in a university was urged.

Prof. G. D. Shepardson, University of Minnesota, advocated the harmonizing of all public educational institutions in a State. Usually universities were chartered by the State and it was difficult to change the charters. Generally speaking, alumni organizations should have advisory powers only.

Professor M. C. Beebe, University of Wisconsin, explained that the two-headed arrangement, as it is called, is being tried at the University of Wisconsin, where there is not only a president, but a business manager, the idea being to allow the president to give his attention entirely to pedagogical duties. This plan seemed to work well.

### ELECTROLYSIS IN REINFORCED CONCRETE.

In a paper by Prof. C. Edward Magnusson, of the University of Washington, and Mr. G. H. Smith much information was given relative to electrolytic corrosion in reinforced-concrete tests made by the authors, showing that concrete and cement, when dry, are good insulators, their specific resistances being of the order of 1000 megohms per cubic centimeter. The conductivity of concrete and cement depends upon the porosity of the material and the nature of the solution in the pores. When the pores are full with an aqueous sodium chloride solution both cement and concrete are fairly good conductors of electricity. The current in the concrete probably follows the ordinary laws of electrolysis, with the liquid in the porous spaces of the concrete mass as the conductor. An electric current of low density passing through cement or concrete does not affect the compressive strength of the material.

When the current leaves the iron through an aqueous solution, oxygen, and under some conditions chlorine, will be liberated at the iron surface. An iron oxide or a salt will be formed and these chemical changes are accompanied by an increase in volume. When iron is changed to ferric oxide the volume is increased in the ratio 1 to 2.2 and a similar increase occurs when the other compounds are formed. No attempt was made by the authors to determine the magnitude of the stress that may be developed in this manner, but it is known that enormous forces are required to prevent chemical action by mechanical pressure. Without doubt the forces produced by chemical action are ample to break the concrete, and all the observed facts can readily be explained on this basis. The observed data give evidence that the corrosion of the iron caused by the electric current precedes the crack in the concrete; that the increase in volume when the iron changes into an oxide or a salt is the direct cause of the failure of the concrete.

*Discussion.*

Mr. Burton McCollum, of Washington, D. C., spoke of the experience of the Bureau of Standards in similar testing work. In testing blocks of concrete a soft band was found near the cathode, seeming to show that there is some electrolytic effect near the cathode as well as the anode. Mr. McCollum spoke of the danger of coating reinforcing iron with insulating paint in relation to the shearing stress. It has been found that filling the pores of the concrete is not effective. Efficiency of corrosion, that is, the percentage of actual corrosion to the maximum, is very important. Most electrolytic corrosion seems to be due to the calcium sulphate in the cement. If this ingredient is left out the efficiency of corrosion is reduced to less than 1.5 per cent. One theory of electrolytic corrosion is that it is due to the migration of the $SO_4$ ion. Whether this may be a contributing cause has not been investigated. As to the actual destruction of structures, it is rather doubtful whether great damage is being done, although the possibility of danger must be realized. In many cases where stray railway cur-

rent has been blamed for failures it has been found that electrolysis has played only a very minor part.

Mr. E. W. Stevenson, of Wilkes-Barre, Pa., referred to a case in Allentown, Pa., where escaping railway current was accused of electrolysis afterward found to be due to the faulty construction of an isolated plant.

Prof. George A. Hoadley, of Swarthmore, Pa., asked if a metallic by-pass could be arranged to take care of the disturbance.

Prof. A. S. Langsdorf, of St. Louis, said that tests he had made several years ago confirm those of Professor Magnusson. Small currents seemed to do as much damage as large ones. However, actual danger is believed not to be imminent. In one case the concrete footings of a building in St. Louis have been bonded to prevent electrolysis.

Prof. G. D. Shepardson, of Minneapolis, said that in many cases of alleged electrolysis the disturbance is due to purely chemical action or to local electrical currents. It is unwise to arouse too much alarm directed against escaping railway current.

Several written communications were received, and in one of them Mr. Guy F. Shaffer, of New York, was earnest in urging ample discussion, as the question has an important bearing on the foundations of buildings in New York.

# Central Station
## Management, Policies and Commercial Methods

### CLEVELAND LIGHTING RATES.

The Cleveland Electric Illuminating Company has reduced its basic rate for lighting service from 12½ cents to 10 cents per kw-hour, with additional units at 5 cents as in the past. The number of kw-hours charged at the maximum rate varies somewhat according to conditions, but it is estimated that the change will effect a saving of from 20 per cent to 25 per cent to the small householder. The company is also working on a schedule for factories. Mr. Robert Lindsay, general manager, states that a reduction of rates has been under advisement for some time, but that the figures were completed only in time to apply the rate on July 1.

### NEW CINCINNATI RATE SCHEDULE.

A new schedule of rates was put into effect the first of July by the Union Gas & Electric Company, of Cincinnati, by which, it is claimed, consumers will effect a saving of from 7½ per cent to 12 per cent over the present plan. The new rate is 10 cents per kw-hour as a basis, with the 10-cent rate applicable for the first thirty hours. For the second thirty hours the rate is 6 cents, and for consumption over this there is a fixed schedule of discounts on the bill ranging from 5 per cent to 50 per cent, until a minimum rate of 1½ cents per kw-hour is reached.

### CENTRAL-STATION WIRING PROPOSAL TO CONTRACTORS.

The Edison Electric Illuminating Company has made a proposal to contractors, extending from July 15 for two months, whereby it agrees to give a wiring job, secured by its new installation bureau on a house already built, to any Brooklyn electrical contractor who secures for himself the wiring of a house already built and along the line of the company's mains. That is to say, every time a contractor independently secures such a job the Edison company awards him a similar job secured by its own staff. The offer is stated to be in the nature of an experiment, but if the results are satisfactory it will be continued beyond the present time limit.

### ADVERTISING THE ELECTRIC FAN.

Although the unusually long-continued warm weather of this summer would seem to make it almost unnecessary to advertise the merits of the electric fan, various manufacturing and operating companies, as well as dealers in supplies, have not relaxed their vigilance in calling attention to the merits of this alleviator of warm-weather conditions. Several concerns point out that it is possible to obtain refreshing sleep by the use of the electric fan in bedrooms. When the night temperature is 90 deg. or more in dwelling houses this is indeed a desideratum. Another point made this summer is that by the use of the electric fan one can practically enjoy a vacation at home, and the Union Electric Light & Power Company, of St. Louis, shows in a newspaper "ad" an attractive picture of children playing about the home in comfort in the breeze of an electric fan. Of course, one important argument for the use of electric fans in offices is that it increases the working efficiency of the office force, and several manufacturers and dealers dwell upon this point.

### REPORT OF ELECTRICAL DEPARTMENT OF SANITARY DISTRICT.

For the year ended Dec. 31, 1910, Mr. D. M. Deininger, comptroller of the Sanitary District, has presented an interesting report of the financial operations of the electrical department of the Sanitary District, operating the hydroelectric plant of the Chicago Drainage Canal.

It is shown that the gross income of the electrical department for the year was $573,550.26, of which $562,546.46 was received from sales of electrical energy for motors and lamps. The total operating expenses are placed at $251,295.77, leaving net earnings of $322,254.49. From this $200,755.03 was deducted as fixed charges, leaving a profit for the year of $121,499.46. The fixed charges include taxes, $30,298.43; interest on plant and equipment, $169,962.08, and rental of leased lines, $494.52. Under the head of general and miscellaneous expense, an item of $75,682.57 is given for depreciation.

The operating expenses are divided as follows: Production expense, $30,645.90; transmission expense, $52,101.33; distribution expense, $22,827.42; utilization expense, $11,896.22; commercial expense, $11,062.51; general and miscellaneous expense, $122,762.39. The last item, which is the largest of all, being nearly half of the total operating expense, includes the item of depreciation heretofore enumerated, $28,101.38 for general office salaries, and a number of other items, including $3,541.94 for insurance.

As might be expected in a hydroelectric plant so favorably circumstanced as this one, the cost of producing electricity is very small, the total production expense being $30,645.90, of which the station superintendence and labor was $21,978.40. In the transmission expense the largest item, $17,279.57, is for substation labor, repairs to substation electrical equipment costing $7,091.22. In distribution expense, the largest item is repairs to transformers, $6,936.34, and the next largest, repairs to overhead dis-

tribution, amounting to $5,274.83. In utilization expense the largest item is for consumers' installations, $4,974.09, and the next largest is for operation and maintenance of utility equipment, amounting to $4,307.20. Commercial expense is made up of commercial demonstration and promotion expense, the latter item amounting to the sum of $7,851.34.

It is interesting to note that of the total sales of electrical energy, amounting to $562,546.46, the sum of $205,173.16 was received from municipalities and public institutions. More than half the receipts, apparently, come from private consumers. The city of Chicago paid the Sanitary District $144,516.47 for electrical energy during the year, principally consumed for street lighting.

The balance sheet given in the report shows that the cost of plant and equipment is $4,590,091.83. As the interest on this is carried as $169,962.08, it must be figured at 3.7 per cent, which is very low. The total number of employees in the electrical department of the Sanitary District on Dec. 31, 1910, was 245, of whom 128 were in the operating departments, seventy-seven engaged in construction work, ten in the accounting department and eight in the engineering department, the remainder being employed in the administration, testing, meter, purchasing, storeroom and contracting departments.

## ORNAMENTAL ILLUMINATION IN MINNEAPOLIS.

The accompanying illustration gives a view of a night scene on Nicollet Avenue, Minneapolis, during the recent civic celebration. To produce the decorative effect over 7000 16-cp lamps were used. Forty-eight 16-cp carbon lamps were used on each post, and the lamps in the festoons were spaced 18 in. apart. Nicollet Avenue is regularly

Night Scene at Minneapolis Civic Celebration.

lighted from tungsten posts, as shown in the illustration. The view is engraved from a night photograph having an exposure of about eighteen minutes, and it will be noted that the sky line of the building is very plain, thus indicating the great volume of light which was thrown upward. The cost of the extra decoration was $10,000, and the power required for lighting the ten blocks covered was about 740 kw. The decorative lighting was designed and installed by the Northwest Electrical Company.

## TOLEDO RATES.

The Toledo Railways & Light Company some days ago filed a demurrer to the petition of the city of Toledo which seeks to force the company to comply with the terms of an ordinance passed some time ago fixing the rate at 8 cents per kw-hour, with a discount of 1 cent if paid by the tenth of the following month. In arguing for the demurrer, Mr. Borton Smith, attorney for the company, alleged that points of illegality exist in several sections of the new ordinance, and said that the income of the company would be increased $20,000 a month if it is enforced. Under the new ordinance everyone using energy must pay 8 cents, with a discount of 1 cent. Under a decision of the Supreme Court, he said, the company has no right to sell energy under a price fixed by the City Council. At least 70 per cent of the company's customers have been paying less than the rate fixed by the city, he said.

The ordinance forces the company to give a discount to those who pay by the tenth of the month following that for which bill is rendered, but the full price is to be charged others. Under the utilities law this is illegal, Mr. Smith said. In fact, to allow a discount is a criminal offense, punishable by imprisonment. He contended further that the city has no right to regulate the minimum charge or force the company to furnish meters. Mr. Smith argued that the matter should have been brought before the public utilities commission, whose business it is to supervise public service companies and regulate rates.

## MERCANTILE BUSINESS OF A CENTRAL-STATION COMPANY.

In the electric-service industry of the present day there are many interesting side lines, so to speak, in addition to the main business of making and selling electricity and of financing the expanding enterprise. In an address delivered before the Commonwealth Edison Section of the National Electric Light Association in Chicago recently Mr. John F. Gilchrist, who is assistant to the president of the Commonwealth Edison Company and also president of the N. E. L. A., explained some of the features of the remarkably large mercantile business of the Chicago company.

The speaker first considered the stores department of the Commonwealth Edison Company, which employs eighty-six men and has charge of all the stores and supplies used by the company. Every effort is made, of course, to keep this stock as low as is consistent with safety, as it represents an investment not earning money directly. The number of merchandise invoices made out daily by this department during the last year reached an average of 276. The department also handles all the second-hand machinery of the company, which is considerable in amount, owing to the number of isolated plants supplanted by central-station service. The company's stationery is also looked after by this department.

In a measure, the purchasing department is complementary to the stores department. In this department there are thirteen employees and about 200 requisitions per day are handled. During the last year the company made purchases aggregating over $9,000,000 from 1050 different concerns; this includes coal handled through a separate fuel department.

About 2700 tons of coal is burned daily in the generating stations of the company at the present time. The stock of coal on hand is about 214,000 tons. The maximum consumption in any one day so far reported was 3471 tons on Jan. 5 last. A little over one-half of the cost of the coal is due to the cost of carriage rather than to the cost of the fuel itself.

Turning to the merchandise-sales end of the business, Mr. Gilchrist remarked that about $850,000 worth of goods (aside from electricity, of course) was sold last year. There are seven employees in this department, and they have relations with the large purchasers of electrical supplies in Chicago. A considerable percentage of the merchandise sales consists of lamps. The Commonwealth Edison Company will probably purchase about 3,000,000 incandescent electric lamps for itself and its customers this year.

About $250,000 is spent annually by the company for transportation, and there is a separate transportation department. The expense of this department is due principally to traffic wagons. The company owns thirty-four electric

delivery wagons, as well as a number of electric runabouts and fifteen gasoline passenger automobiles. It has also 119 horses, but it is the policy of the company not to buy any more horses, supplanting them with automobiles as the present stock of animals gives out. No less than 103 men are employed in the transportation department.

The employment department, with its eight employees, has many and varied duties, but perhaps its chief task is to keep up a list of 600 accepted applicants who have become eligible for positions in the company's service. Other departments make requisitions on this department when additional help is needed, and it is important that the list of accepted applicants be kept up to date. All new employees must report for medical inspection within two weeks after accepting employment with the company. This is done so that the force of the company's employees, now numbering about 3200 persons, may not be exposed to contagious or infectious diseases. About forty applications for employment are received every day, and about 2000 positions were filled last year, perhaps 80 per cent of these being caused by resignation, discharge or death, the remainder being due to the growth of the company. The employment department has a number of miscellaneous duties and is the headquarters for the examining board, which considers applications for promotion or change from one department to another. This department has a great deal of correspondence, handling about 30,000 letters a year.

One of the newer departments is the information bureau, which has five employees and answers about 600 inquiries daily. This bureau is prominently located on the street floor of the headquarters building, and has proved its usefulness in many ways. In general, under the supervision of the president's office, it has charge of handling the mail and of all interdepartmental communications, with a complete messenger service. About 4000 pieces of United States mail and 3000 pieces of interdepartmental messages are handled daily by this department.

Electric Shop, the beautiful display-room and salesroom of the Commonwealth Edison Company, was established first with no idea of making a commercial profit in itself, but simply to be an adjunct in extending the company's sales of electricity, and also to be a convenient and handsomely appointed downtown meeting place for the company's customers, particularly ladies. The shop is one of the handsomest and best located in Chicago, and as the enterprise has developed, is becoming a source of profit to the company. All sorts of electrical goods are sold here to the general public, ranging from the most expensive art lamps and fixtures to the utilitarian devices of every-day life. A mail-order business is about to be started here, and it is believed that this department will be of assistance to small central-station companies in other cities, enabling their customers to obtain electricity-consuming devices in a convenient way.

## MILWAUKEE HOUSE-WIRING CAMPAIGN.

Since April 1 an old-residence house-wiring campaign along rather unusual lines has been under way in Milwaukee, where the central-station company (the Milwaukee Electric Railway & Light Company), while holding itself in readiness to do wiring according to a fixed and advertised schedule, takes care to advise and even to demonstrate to prospective customers that local contractors can do the work more cheaply.

Realizing that many householders have an ungrounded fear of the excessive cost of wiring, the central-station company desired to place in the hands of its solicitors means of quickly arriving at an outside or limiting cost figure for a given job, which could be quoted to the customer and for which the electric company would itself guarantee to do the wiring, taking its payment in twelve monthly instalments. The elements of this cost schedule, which are set forth in a booklet distributed to "prospects," are given below.

Having reassured the householder that the cost of wiring is not unreasonable even at this price, which, the solicitor explains, is itself an outside figure, intended to cover general cases, the company's representative is then further able to enlist the interest of the customer by suggesting that some local contractor can probably make even a better price. A contractor is summoned, and, after estimating on the job, he usually offers to do it at a figure about three-quarters of the list price quoted by the electric company. This estimate is based on payment for the work in twelve monthly payments, but if the contractor prefers—and he usually does—the company offers to hand him cash for the price of the job minus 10 per cent—later reimbursing itself by collecting the amount in twelve monthly payments from the customer.

As the result of this method of soliciting house-wiring contracts, the salesman is able to furnish quickly an estimate on the limiting cost of the work. This acknowledged limit reassures the customer that he will not be subjected to unexpected extra charges, whether the company or the contractor does the work. The customer is also pleased by the attitude of the company in helping him to have the work done more cheaply than at its own price. The contractor is pleased and his attitude kept friendly to the company by having business turned over to him, without cost of soliciting, which has been met by the company. The central station avoids the trouble of conducting a wiring business and enjoys the good will of both customer and contractor by this policy. The getting of houses wired by contractors has throughout been the ultimate purpose of the company, and in this it has been entirely successful, the work in the case of the 200 houses thus far connected being in every instance done by contractors, in competition with the company's figures.

The time-payment plan offered by the Milwaukee Electric Railway & Light Company is tendered only to the owners of completed but unwired residences on the company's lines, who are permitted to pay the cost of the installation in twelve monthly instalments, due with the monthly bills for electric service, which the customer contracts to use for one year. In case of cash payment of the entire amount the customer gets a discount of 5 per cent.

The following cost figures per outlet have been taken as liberal estimates of the cost of doing wiring, the effort being made, as already explained, to safeguard the company in case it is required to do the work, but preferably to deflect the business into the regular channels. This wiring schedule also differs from those in which the cost per outlet diminishes with the number of outlets, as it has been assumed by the Milwaukee officials that after getting the tools and men on the job the cost of installing the fiftieth outlet is not likely to be less than the twenty-fifth or the tenth. To cover the above-mentioned "starting" costs,

HOUSE-WIRING COST SCHEDULE.

| | Base Charge. | Outlet Charge. Per Outlet. |
|---|---|---|
| *Wiring:* | | |
| Single flooring | $4.00 | $3.00 |
| Double flooring | 4.00 | 4.00 |
| Hardwood flooring | 4.00 | 4.00 |
| *Switches:* | | |
| Push-button switches, each | | $1.00 |
| Push-button three-way switches, per set of two switches | | 2.50 |
| Rotary switches, each | | 1.00 |
| Rotary three-way switches, per set of two switches | | 2.50 |
| Snap switches, each | | .50 |
| Snap switches, three-way, per set of two switches | | 1.50 |
| Bryant flush plate receptacles | | 1.00 |
| Chapman flush plate receptacles | | 1.25 |
| Hubbel baseboard receptacles | | 1.25 |
| Drop cord with key socket | | .75 |
| Drop cord with chain pull socket | | 1.00 |

however, a base charge of $4 per installation is added to the fixed cost per outlet, but in return for this extra $4 the customer is entitled to have installed, without cost, extra outlets for heating appliances in kitchen and dining-room. The cost of wiring for different classes of building construction, as given in the company's booklet, is printed on the preceding page.

The booklet also contains illustrations and prices of types of fixtures offered by the company in connection with its house-wiring campaign, together with its rules for the renewal and sale of lamps.

From four to eight salesmen have been continuously engaged in the Milwaukee house-wiring campaign under the general direction of Mr. C. N. Duffy, comptroller of the Milwaukee Railway & Light Company, who is also general sales manager of the electric-lighting department. In inaugurating the campaign, the city was divided into sections and a house-to-house canvass was made.

# Wiring and Illumination

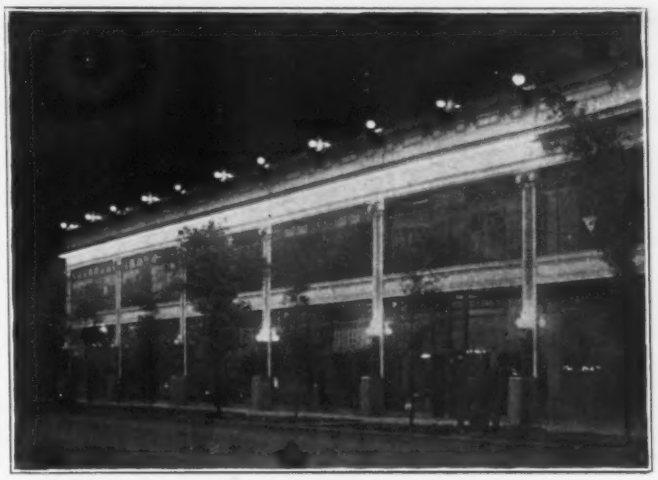
## ILLUMINATION OF THE BRONX OFFICE OF NEW YORK EDISON COMPANY.

In order to secure a better distribution of light over the front of the building of the Bronx office of the New York Edison Company, a scheme of cornice lighting has been installed. Two hundred 8-cp frosted, carbon-filament lamps are extended from the cornice at an angle, throwing a soft light over the entire front of the building. One hundred of these lamps are run across the first-floor cornice and 100 across the roof cornice. The lamps are supported by iron braces on the cornices, extending 2 in., and bringing the lamps to a slight angle, thus procuring the distribution of light. The brackets are so arranged that they can be withdrawn or extended 4 in. or 5 in. further, bringing the lamps to any angle desired. The installation was made by Evans & Kaestner, electrical contractors.

Bronx Office of the New York Edison Company.

## SPECIAL LIGHTING AS ARCHITECTURAL FEATURE OF A BUSINESS BUILDING.

The new La Verne Building, in that part of Michigan Boulevard, Chicago, known as "Automobile Row," was designed with special respect to the use of elaborate electric lighting effects in connection with its architectural ornamentation. As the result of the 10,000 watts total rating in tungsten lamps on its 290-ft. glazed terra-cotta front, this building probably presents the most striking after-dark appearance of any on the boulevard, which is thronged nightly with passing automobiles. Of further interest is the fact that this elaborate lighting is maintained by the owners as part of the operating expense of the building, and is operated quite independently of the tenants, who are principally automobile sales representatives. The cost of the special lighting, from dusk to 11 p. m., is said to be only $800 a year, which is wholly disproportionate to the striking publicity effects gained by this small expenditure.



Tungsten Lighting on the La Verne Building, Chicago.

The La Verne Building, when completed, will have a 290-ft. front, containing twelve 24-ft. storerooms on the ground floor with an equal number of second-story glass-fronted display rooms. The entire front of the building is of glazed white terra cotta.

Marking the division walls between each pair of store fronts are terra-cotta standards on which sit massive bronze standards, each surmounted by four 40-watt tungsten lamps inclosed in separate 12-in. frosted balls. Beneath the cornice, 30 ft. above the pavement, is an inverted trough containing 290 25-watt clear tungsten lamps, spaced 1 ft. apart. These lamps are protected from the weather by the overhang of the cornice, which also serves as a reflector to direct most of the light downward. On bronze bracket pieces, at 12-ft. intervals along the top of the cornice, are mounted 40-watt lamps inclosed in 14-in. frosted globes.

The storerooms are illuminated by an arrangement of beam lighting, in which the 25-watt lamps in reflectors, placed at 1-ft. intervals behind the ceiling beams, project all light downward and onto the objects in the room, the units themselves being invisible from the front. Within the storerooms, as outside on the street surface, a very high intensity of illumination is thus obtained.

The electric-lighting service of the La Verne Building is distributed from a switchboard in the basement and from cut-out cabinets on the first floor near the center of the building. Conductor sizes have been selected so as to give less than 1 volt difference in voltage, due to drop, at the numerous outlets of the installation. Mr. A. S. Alschuler was architect of the building, the lighting plans of which were prepared by Mr. M. C. Hartman.

## ORNAMENTAL STREET LIGHTING IN KOKOMO, IND.

By O. M. Booher.

Kokomo, with a population of over 17,000 people, is a typical hustling manufacturing center of northern Indiana, whose merchants appreciate the commercial advantage derived from an ornamental and efficient street-lighting system. They at once see that such improvements reflect credit upon their city, please the people and indicate very decidedly their city's prosperous condition and progressive spirit.

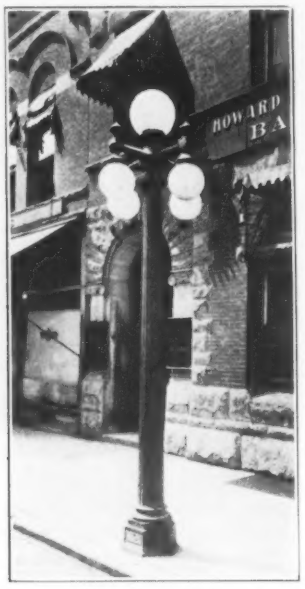



Fig. 1—Kokomo Standard.

The Kokomo, Marion & Western Traction Company, which operates a central station in Kokomo and serves the people with electrical energy, was quick to grasp the situation enhanced by the public desire for better street illumination and immediately directed the efforts of the "new-business" department to making a special study of the various systems of modern street illumination and to selecting fixtures which should secure to the fullest measure possible modern ideas both in construction and in the matter of artistic effect.

The solicitors of the company called on the most important merchant of each block and outlined the benefits to be derived from a comprehensive scheme of ornamental lighting. This merchant was asked to serve as trustee of his respective block and to call upon his neighbors for their support. With very few exceptions each merchant asked to serve as trustee willingly accepted and did all he could to forward the movement. In this manner a co-operative force was organized and put in the field to secure the names of the remaining merchants benefited by the improvement. The following method was employed in financing the installation.

The municipal authorities were asked to prepare an ordinance embodying the city's agreement to pay for maintenance and current costs for a period of five years, provided the merchants were willing to pay all installation costs. The ordinance passed the Common Council by a unanimous vote.

The city was asked to pay maintenance and energy costs because otherwise those who might not be directly benefited by the improvement would sooner or later withdraw from the list, thus creating a deficit in the central station's monthly revenue.

The standard selected by the Kokomo, Marion & Western Traction Company is shown in Fig. 1. This standard, which is made by the Adams-Bagnall Electric Company, is of cast and pressed steel and represents an interesting development in ornamental street-lighting specialties. Each standard supports one 100-watt and four 60-watt tungsten lamps inclosed within special diffusing globes of 16 in. and 12 in. diameters respectively. The standards are placed on both sides of the street in a parallel position and at intervals of 85 ft. Connections are made by means of a steel-taped lead cable containing three No. 10 double-insulated copper wires which is placed in the gutter a few inches beneath the pavement. A pair of switches is provided for controlling each half block, these being placed at the alley intersections and operated by the night patrolman. The three-wire arrangement permits the larger lamps to burn entirely independent of the smaller lamps. All lamps burn from dusk until 11 o'clock; the 100-watt lamps burn all night.

The monthly revenue per lamp, including maintenance, realized by the central station is as follows:

| | |
|---|---|
| Four eleven o'clock 60-watt lamps | $2.60 |
| One all-night 100-watt lamp | 1.45 |
| Total monthly revenue per post | $4.05 |

The price charged the merchant to cover the installation costs was $1.15 per front foot.

Forty-two of these standards have already been installed. The merchants are exceptionally well pleased with the pedestal scheme of lighting, the property owners feel that it is a good investment, and evidence of the satisfaction is indicated by a further contract for three or four additional squares. It is hoped in the near future to light Kokomo's entire business section in the same effective manner.

Fig. 2—Day View of Main Street.

Fig. 3—Night View of Sycamore Street.

# LETTERS TO THE EDITOR.

## Double-Wound Single-Phase Motor.

*To the Editor of Electrical World:*

SIR:—In your issue of June 1, in a report of the papers presented at the N. E. L. A., an abstract is given of a description of a commutator-type, single-phase motor, using a double-wound rotor, with a magnetic separator between the squirrel-cage and commutated winding. This type of rotor has been in successful use since 1905 in motors of ½ hp and smaller. Application for a patent on this device was filed by the writer Nov. 17, 1905, and the patent (No. 848,719) was issued April 2, 1907. A motor using this device was described in the *Electrical World* of July 7, 1906, and in the issue dated July 13, 1907, a more complete description was given of the same motor.

This device suppresses sparking and relieves the commutator, especially at running speed, by shifting part of the load to the squirrel-cage winding. It is applicable to any commutator-type, alternating-current motor, either single or polyphase.

*St. Louis, Mo.* EDW. BRETCH,
*Advance Electric Company.*

## Underground Distribution in a Small Town.

*To the Editor of Electrical World:*

SIR:—I note in your issue of July 1 that there seems to be an increasing interest in underground cable work in small communities where the esthetic sense of the public does not desire poles. We have been interested in this subject since we bought up our local plant in 1902, and in a village of 1900 inhabitants we have 15 miles of duct and no poles whatever. We have developed a very reasonable type of construction for this method of distribution and we should be glad to give any one the benefit of our experience in this line. We can doubtless save them some money, as we have learned much that one cannot find in books.

Incidentally we may say that the chief source of satisfaction from the underground construction, aside from the elimination of poles, lies in the fact that we have no maintenance account. Since we learned how to install cable cheaply we have had no repairs, and, so far as it is possible to determine, cable laid eight years ago is in perfect condition to-day. We should be glad to have any one contemplating such an installation call on us at any time. There is so much to say about this matter that one cannot write about it without interfering with his business, but for downright satisfaction in snowstorms, thunderstorms or any other disturbances that might cause interruption to service there is nothing like underground distribution.

HENRY BURDEN,
*President Cazenovia Electric Company.*
*Cazenovia, N. Y.*

## Nomenclature of Instrument Transformers.

*To the Editor of Electrical World:*

SIR:—In your issue of June 1, page 1446, it is stated in reference to instrument transformers that while the terms "current transformer" and "potential transformer" "would be understood by operating men, they are not correct. 'Series' and 'shunt' are preferable to 'current' and 'potential.'" In this connection it may be of interest to note that the contrary view is apparently held by some other authorities. In the Meter Code prepared by the Electrical Testing Laboratories for the joint use of the Association of Edison Illuminating Companies and the National Electric Light Association on pages 53 to 59 the terms "current transformer" and "voltage transformer" are used to the exclusion of the terms "shunt" and "series." The term "shunt transformer" does not appear in the Code, and "series transformer" only in the index in the way of a cross reference to "current transformers." In the July, 1909, *Proceedings* of the American Institute of Electrical Engineers, page 981, in a paper by Mr. L. T. Robinson, of the standardizing laboratory of the General Electric Company, the terms "current" and "potential" transformers are used and no mention whatever is made of "series" or "shunt" transformers. In reprint No. 116 of the Bureau of Standards the term "series transformer" is used in the text, but the general heading on page 23 is "current transformers." The adjective "shunt" does not appear, "potential" being used exclusively. It may here be stated that if one uses the adjective "potential" he is logically committed to use "current" also, just as he who uses the adjective "shunt" to be consistent should use "series" also. In later instrument transformer *Bulletins* (reprints Nos. 129 and 130) of the bureau, the adjectives "series" and "shunt" do not appear, "current" and "potential" being used exclusively.

I think from the foregoing that the Bureau of Standards, the Electrical Testing Laboratories, the meter committees of the Edison and the National Electric Light associations, and the standardizing laboratory of the General Electric Company may all be said to prefer the terms "current" and "potential" (or "voltage") transformer to "series" and "shunt" transformer, and that their views have weight from the viewpoint of both the engineer and the physicist. The writer believes the terms "series" and "shunt" as applied to instrument transformers are not in general use as much at present as they were ten years ago and that they are being abandoned in favor of "current" and "potential" (or "voltage"). This would seem to be the case with the Westinghouse company, for in its 1902 catalog (No. 300, pages 109 and 172) the adjectives "series" and "shunt" are used in reference to instrument transformers, while in its 1910 catalog (No. 3001, sec. 731) "current" and "voltage" are used exclusively.

The General Electric Company as far back at least as 1901 was using "potential" and "current" in preference to "shunt" and "series," and the same is true to-day. After some years' experience in the meter work of a light and power company and the testing and care of instrument transformers, both out on the line and in general power-house and substation use, the writer personally prefers the terms "current" and "voltage." It seems to me, from the viewpoint of precise English, perhaps there is little choice between "series" and "current" and "shunt" and "voltage," as applied to instrument transformers, but as expressive and apt terms for every-day use in making practical electrical measurements, or in the literature of that subject, "current" and "voltage" are preferable for use in that connection.

*Toledo, Ohio.* JOHN GILMARTIN.

[Commercial dicta or personal preference scarcely furnish authority for changing technical nomenclature from a more correct to a less correct form. Lack of regard for this consideration is what fosters the spread of "engineering English." The qualifying words "series" and "shunt" describe properly the types of transformers used with instruments. The words "current" and "potential," or "voltage," are objective in their significance and therefore are secondary qualifications. Moreover, the so-called potential transformer is a "potential" transformer in that it sets the ratio of the primary and secondary voltages; it is likewise a "current" transformer in that it sets the ratio of currents. The so-called constant-current transformer is a "current" transformer in setting the ratio of currents; it is likewise

a "potential" transformer in varying the ratio of the primary and secondary voltages. Thus all transformers are equally as much "voltage" transformers as "current" transformers, while specifically some instrument transformers are connected for "series" service and some for "shunt" service. Hence the desirability of employing the terms "series" and "shunt" in the designation of instrument transformers.—Ed.]

# Digest of Current Electrical Literature

ABSTRACTS OF THE IMPORTANT ARTICLES APPEARING IN THE ELECTRICAL PERIODICAL PRESS OF THE WORLD

### Generators, Motors and Transformers.

*Direct-Current Armature Windings.*—H. C. Walter.—A discussion, with the aid of diagrams, of the "lap" and "wave" forms of closed-coil drum windings used on direct-current armatures. These forms cover practically all of the important windings for modern large and moderate-sized direct-current machines.—*Elec. Jour.*, July.

*Series Transformer Characteristics.*—Harold W. Brown.—An article introductory to a later discussion of various connections of series transformers in three-phase, three-wire and four-wire circuits. Outlines are given of the characteristics with short-circuited secondary, with resistance and reactance in the secondary circuit, with interconnected secondaries and with secondaries in series and in parallel.—*Elec. Jour.*, July.

*Variable-Voltage Motor-Generator.*—A note on a British patent (No. 29,726, June 22, 1911) of Crompton & Company and Mr. H. Burge relating to a method for converting constant-voltage alternating current into variable-voltage direct current. Use is made of a rotary converter driving a direct-current generator wound for the same voltage and connected in series with it and provided with a reversing field regulator, so that current can be delivered at any voltage from zero to twice that at the brushes of the converter.—Lond. *Elec. Eng'ing*, June 29.

### Lamps and Lighting.

*Indirect Lighting.*—Justus Eck.—In order to controvert the view that indirect lighting gives an illumination that fails to produce proper light and shade effects, the author reports the result of measurements taken in a room illuminated by an inverted-arc lamp. The tests showed a contrast in illumination values practically the same by artificial light as by daylight.—Lond. *Electrician*, June 23. In a communication from Mr. Hayden Harrison attention is called to the fact that "inverted-arc lighting can hardly be described as indirect lighting" in that the illumination is not derived from all directions, and inasmuch as the illumination of the ceiling is twenty times that of the floor.—Lond. *Electrician*, June 30.

*Coronation Illumination.*—Large quantities of special fittings, wiring material and devices were required for the illumination during the celebration of the coronation of the King and Queen of England. Details of the lighting equipments are given in Lond. *Elec. Eng'ing*, June 29, and Lond. *Elec. Times*, June 29.

### Wires, Wiring and Conduits.

*Three-Wire Direct-Current Service Connections.*—W. A. Vignoles.—An illustrated article giving cost data relating to service connections in three-wire direct-current underground systems. Particulars are given of connection boxes that have been used with much satisfaction at Grimsby, where the main leads are triple-concentric cables, the neutral being on the outside and the negative at the core. The article is of interest to central-station engineers in showing the methods that have proved satisfactory in installing underground circuits, although the methods employed are not wholly in accord with American practice. Fig. 1 shows a form of junction box for street-lighting service designed for use where the chief requisite was small cost. The taps are made to only the outer and middle leads of a triple-concentric cable—balance of load being obtained at other locations—so that it was necessary to cut only the outer conductor, the middle conductor being simply bared to receive the connection; the inner conductor was not touched. The current required for each service connection being small, sufficient contact is made by the copper strip "nipped" up on to the middle conductor with a special Prescott fitting without damaging the paper insulation underneath. The joints onto the outer fitting are made by binding the wires to the fitting and sweating; these joints have to carry the full current flowing along the main, and hence they must be well made. The box itself is of cast lead, which enables the two halves of the box to be sealed by soldering; this is much safer than any joint that can be made between the lid and the box where cast iron is used. Use is made of twin service cable connected directly to the fittings on the distributor, doing away with the fittings on the service cable. This box, with fittings, costs $1.32. It has been found by experiment that from 30 amp to 50 amp can be taken through this joint without heating, so that in the future this box will be used for all services from the positive side of the three-wire system for not more than 30 amp. The box shown in Fig. 2 has been designed for

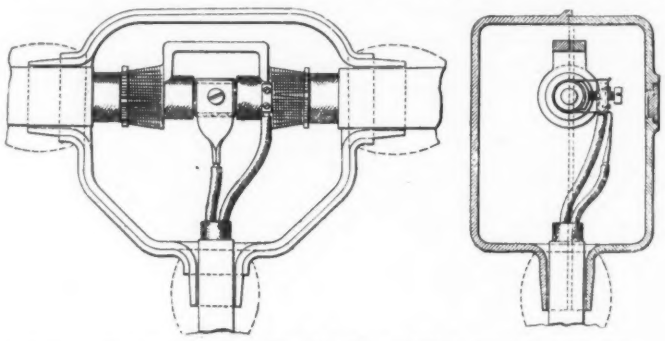


Fig. 1—Box for Positive Service from Triple-Concentric Cable.

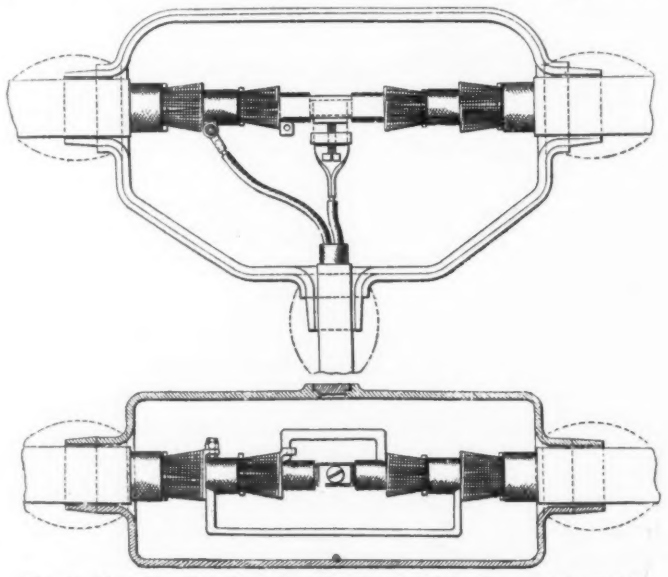


Fig. 2—Box for Negative Service from Triple-Concentric Cable.

connections between the core and outer lead; the service cable would be of the twin type and the connections would have to carry at least 20 amp. The cost of this box is

about $1.56. Fig. 3 shows a box used where the main leads are brought out separately rather than concentrically. The box is considerably smaller than one for a triple concentric cable. When used with concentric service wires the cost is about $1.74; where twin service wires are used the cost is reduced to $1.32 because no fittings are required for the ends of the service cable. The author stated that it is cheaper to use twin service cable in most cases, although

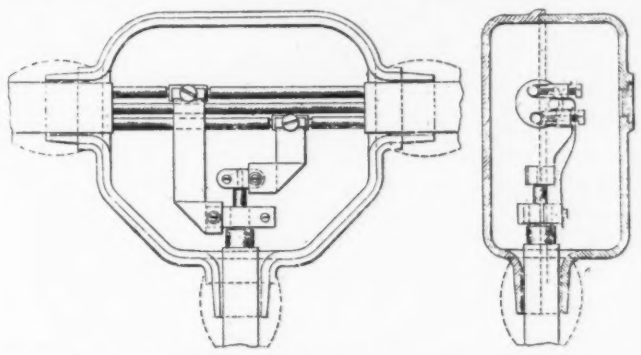


Fig. 3—Box for Concentric Service from Three-Core Leeds.

it costs about 10 per cent more than concentric, there being the saving of about 18 cents in the fittings in the fuse box, while labor in jointing is also less. The service wires would have to be of considerable length before the saving would be neutralized by the extra cost of cable, as this in the most usual cases would be only about 2 cents per yard.—Lond. *Electrician,* June 23.

**Generation, Transmission and Distribution.**

*Brighton Generating Station.*—An illustrated article devoted to the Southwick steam-turbine generating station of the Brighton Corporation. Details are given of a 3500-kw turbo-generator, the turbine of which is of the "two-cylinder" Parsons type, for which high efficiency is claimed. The specific steam consumption at a load of 3550 kw was 13 lb. per kw-hour with inlet pressure of 200 lb. per square inch and temperature of 523 deg. Fahr., and outlet vacuum of 28.46 in. mercury column.—Lond. *Electrician,* June 23.

*Electricity in Mining.*—JAMES MILLER.—An abstract of a paper read before the Rugby Engineering Society. After outlining the conditions which render it desirable for a coal-mining company to install its own generating plant rather than to buy electrical energy from a transmission company, the author describes the electrical systems now in use. The electrical side of the generating plant is, almost without exception, three-phase. The generating voltage varies between about 3300 and 3400, according to the requirements. Where the amount of energy to be transmitted is comparatively small and the distances not very great, it is usually found most economical to generate at about 500 volts, as the cost of transmission would be considerably less for the low voltage than for the high. Again, this saves transforming down for motors working at the coal face, where high voltage cannot be used. If the amount of energy to be transmitted is large, then high-tension transmission is nearly always adopted. With the introduction of electricity pumping in mines has undergone a radical change. The type of pump most commonly in use for underground work is the reciprocating pump, generally of the three-piston or four-piston type. This type of pump can be made in a very compact form, and the torque on the motor is practically constant, as is also the flow of water. The motor generally used with this form of pump is the squirrel-cage type, as it can easily be arranged that the motor starts on light load only, a by-pass valve being provided on the pump. This pump is generally placed along with the driving motor on a common-base plate, and it has several distinct advantages over its rival, the reciprocating pump, namely, the space and cost are less and no heavy foundations are necessary. On the other hand, where the head is very large it may be necessary to do the pumping in several stages, thus increasing the initial cost, and the turbine pump is efficient at only the particular head for which it was designed. At the Cowie Colliery, Stirlingshire, turbine pumps have recently been installed to deliver 1000 gal. per minute against a head of 1020 ft. The pumps are arranged in three stages. The bottom stage consists of a multi-stage pump driven by a direct-current motor running at 1100 r.p.m. and capable of pumping 600 gal. per minute against a head of 234 ft. and taking 80 hp. The middle stage consists of a pump capable of pumping 740 gal. per minute against a head of 354 ft., when driven by a motor running at 1000 r.p.m. and taking 86 hp. The top-lift pump runs at 900 r.p.m. and discharges 900 gal. per minute against a head of 432 ft. and takes 236 hp. This means that the power absorbed is about 400 hp. The total cost of the plant was about $5,000, exclusive of the cost of the pipes. When the cost of the generating plant was added to this there would be a saving of probably $15,000 over a steam-engine installation and there would be a considerable saving in the pipes, as a much higher velocity would be used, hence much smaller pipes. The cutting of coal by machinery has been in operation for the last forty years, but until a comparatively recent date it was carried out on only a very small scale. At first only direct current was used for driving coal-cutters, as it was essential for the older form of coal-cutter that the motor should be able to start up under load in case the machine should be shut down under load; but at the present time there are coal-cutters which are driven by squirrel-cage induction motors, and induction motors with wound rotors are also extensively used with great success. The author stated that the judicious use of properly selected coal-cutting machinery makes possible the profitable working of the very thin seams which could not possibly show a profit when worked by hand. For the haulage of the coal from the inner workings to the pit bottom, use is made of three types of equipments, namely, the main rope haulage, the main and tail haulage and the endless haulage. As showing the economy which can be effected by the installation of electric-haulage equipment underground rather than a surface haulage system the author gave the following data: The length of the road is 1500 ft., the haulage is of the endless type with a rope speed of 1⅛ miles per hour, and the power absorbed is about 33 hp. The total output is 300 tons per day, and the cost of working it is found to be 0.78 cent per ton. Originally this road was worked by a steam-haulage gear on the surface, and the working cost was found to be 3.54 cents per ton. This shows a clear gain of 2.76 cents per ton, which with this output means a saving of about $1,500 per annum. Electric locomotives are used to some considerable extent on the Continent for underground work, but there are very few in operation in England, probably because of the stringent mine regulations existing. They are only suitable for use in roads exceeding 6 ft. in height, and, of course, can only be used in roads which are ventilated with fresh air—that is, for roads near the downcast shaft—on account of the considerable amount of sparking at the collector.—Lond. *Electrician,* June 16.

**Traction.**

*Leeds-Bradford Railless Trolley Traction.*—The official opening of the Leeds and Bradford railless trolley routes took place on June 20, the event being celebrated by a luncheon served at the Leeds Town Hall to about 200 guests. The cars employed are constructed to hold twenty-eight passengers and are driven by two 20-hp motors. They run smoothly on wheels with solid rubber tires. If necessary they can be steered to the extreme edge of the road.—Lond. *Electrician,* June 23. Illustrated articles giving details relating to the cars and overhead supply system appear in Lond. *Elec. Eng'ing,* June 29, and Lond. *Electrician,* June 30.

*Gasoline-Electric Omnibus.*—A fully illustrated article giving details of a gasoline-electric omnibus placed in public service in London. The vehicle carries a four-cylinder engine spring-connected to a generator arranged to operate at speeds of from 350 r.p.m. to 1400 r.p.m. The generator supplies energy at an emf of from 0 volt to 400 volts to a series-wound motor coupled through a universal joint to the propeller shaft which drives the back axle through a worm and worm-wheel and differential mechanism. On level roads and ordinary gradients the whole of the control is effected by a gas-throttle pedal operated by the driver's foot. On steep gradients shunt resistance is employed to allow of increased engine speeds.—Lond. *Elec. Review,* June 23.

**Installations, Systems and Appliances.**

*Electricity in Newspaper Plant.*—L. B. Breed.—An illustrated article devoted to the electrical equipment and operating characteristics of the newspaper printing plant of the Pittsburgh *Press.* The equipment includes seventy-four 110-volt, direct-current motors, aggregating in rating 435 hp. The matrix driers are heated electrically, the temperature being maintained automatically between 350 deg. and 380 deg. Fahr. There are four driers, each of which consumes between 1.10 kw and 13.5 kw. In a separate article by Frank Thornton, Jr., data are given showing that the total amount of energy required for a period of seven days to produce 270 matrices for the various editions of the paper, including one Sunday morning edition, was 1050 kw-hours.—*Elec. Jour.,* July.

*Domestic Uses of Electricity.*—A. Hugh Seabrook.—In an article on encouraging the use of electricity for domestic purposes, other than lighting, the author considers briefly the bearing of the following on the problem: The rates for service, the business-getting department, showrooms, hiring accounts, hire, purchase, cookers and the business instinct. Examples are given of the methods followed by the author in the St. Marylebone undertaking.—Lond. *Electrician,* June 23.

**Electrophysics and Magnetism.**

*The Biological Effects of Radium.*—William Allen Pusey.—An address before the Illinois State Academy of Science. Attention is called to the similarity of the radium burns to X-ray burns, the effects of the two agents upon tissues being practically identical. When the human skin is exposed for a sufficient length of time to an active radium salt a definite reaction is set up, of which the first striking feature is that it does not develop until after a relatively long period of quiescence—as a rule about two weeks. The reaction resembles sunburn, but the process may go much further, and reach a condition which is in fact an exact, sometimes exaggerated, picture of the atropic senile skin with its dilated blood vessels and senile keratoses. The author claimed that cancers can be produced by excessive X-ray or radium burns. He described the various uses to which radium, properly controlled, can be put for therapeutic purposes.—*Science,* June 30.

**Electrochemistry and Batteries.**

*Treatment of Sulphated Storage Cells.*—G. A. Perley.—When a lead storage battery is neglected sufficiently white lead sulphate forms over the surface of the plates and the storage capacity decreases accordingly. The author reports the results of a detailed study of the problem of restoring the cell to its initial condition. He states that a badly sulphated cell can be restored by charging at the normal rate in a sodium sulphate solution. It is desirable, but not necessary, to use lead dummies outside the end plates. The concentration can be varied within very wide limits, but a concentration of 200 grams of $Na_2So_4$. 10 $H_2O$ per liter is recommended. It is essential to the life of the cell that the sodium sulphate should meet the requirements as to purity which are laid down for battery acid. A very badly sulphated cell can be restored by about sixty hours' charge at normal rate. The cost of electrical energy to restore a 40-amp-hour cell should not exceed 10 cents. Since sodium sulphate is not deleterious to the cell it is not necessary that the sulphate solution be washed completely out of the pores of the plate.—*Jour. Phys. Chem.,* May.

**Units, Measurements and Instruments.**

*Mechanical Electric-Current Gage.*—A brief outline of a novel device for ascertaining to a fair degree of approximation the current in a conductor without severing the latter or interfering with it in any way. The instrument is known as a "Frisy current gage." It partakes of the nature of a pair of tongs, as shown in Fig. 4.

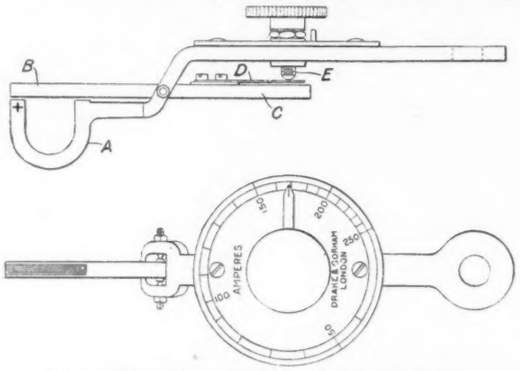



Fig. 4—Elevation and Plan of Current Gage.

A V-shaped bend of laminated iron *A* is fixed to a prolongation of the handle, and a lever carrying an iron armature *B* is pivoted between centers *J* carried by the latter, approaching the iron bend at one end, and carrying a flat spring *D* at the other. A screw *E* bearing against the spring is turned by a milled head *F* provided with a pointer, which moves over a dial. In use, the instrument is applied to the cable, fuse or other conductor, so that the latter lies anywhere in the bend, magnetizing the iron, and attracting the armature against the poles, the pointer having first been set to the zero position. The screw is now slowly turned until the armature springs away from the poles, when the current strength is indicated by the position of the pointer on the scale, which is divided from 20 to 250 amp. The instrument is of extremely simple and strong construction, and should prove of utility in various applications; for instance, the currents in the several cables connected to the busbars in a feeder pillar can quickly be gaged, and similarly the current in the cables in a street manhole, on a switchboard, etc., can be ascertained.—Lond. *Elec. Times,* June 29, Lond. *Elec. Eng.'ing,* June 29, and Lond. *Elec. Review,* June 30.

*Harmonic Analysis Diagrams.*—R. Beattie.—An analysis of a single-valued periodic junction by measurement of the ordinates when the curve is plotted to rectangular co-ordinates. For convenience of analysis according to Fourier's theorem, the scale for measuring the ordinates is made non-uniform, being arranged as either reciprocal sines or reciprocal cosines, so as to avoid the laborious multiplications required with uniform scales. The author shows that, although the diagrams for the higher harmonics would usually be constructed with a relatively increased number of ordinates to correspond to the order of the harmonic sought, yet it is possible with the expenditure of a little extra labor to use a diagram of a few ordinates in such a way as to be practically equivalent to a diagram of many ordinates.—Lond. *Electrician,* June 9 and 16.

**Telegraphy, Telephony and Signals.**

*British Conference on Telegraphy.*—At a meeting of the Imperial Conference, held on June 15, Sir Joseph Ward presented the following motion dealing with the subject of inter-commercial communication: "That, in view of the social and commercial advantages which would result

from increased facilities for intercommunication between her dependencies and Great Britain, it is desirable that all possible means be taken to secure a reduction in cable rates throughout the empire." The motion was discussed by Postmaster-General H. L. Samuel, Sir Wilfrid Laurier, Hon. A. Fisher, Hon. G. F. Pearce, Sir DeV. Graaff and Sir. E. Morris, the resolution being agreed to. The following resolution by Postmaster-General Samuel was unanimously adopted: "That, in the event of considerable reductions in transatlantic cable rates not being effected in the near future, it is desirable that the laying of a State-owned cable between England and Canada be considered by a subsidiary conference." The following resolution, presented by Sir Joseph Ward, was also approved: "That the great importance of wireless telegraphy for social, commercial and defensive purposes renders it desirable that a chain of British State-owned wireless stations should be established within the empire."—Lond. *Electrician*, June 23. An editorial note commending to the above-mentioned subsidiary conference the consideration of a scheme for encouraging additional private-owned cables as alternative to a State-owned cable scheme appears in the Lond. *Elec. Review*, June 30.

**Miscellaneous.**

*Precipitation in the Sierras.*—CHARLES H. LEE.—A report of investigations of the annual precipitation in the Sierras as affected by altitude which have been conducted for the benefit of the Los Angeles aqueduct. The report strongly confirms earlier observations that the precipitation is higher the greater the altitude. It was found that the annual precipitation upon the west slope of the Sierra, between the Yuba and Tuolumne Rivers, increases at a variable rate which, expressed as an average, is 0.85 in. per 100 ft. rise between the floor of the Great Valley and the 5000-ft. contour. Above the 5000-ft. contour it decreases approximately at the rate of 0.40 in. per 100 ft. rise to the crest of the Sierra. Precipitation upon the east slope of the Sierra decreases at differing rates depending on the elevation of the crest and depth of precipitation at the summit. The rate is constant above the 5000-ft. contour and for the sections studied is as follows: Central Pacific, 1.74 in. per 100-ft. fall; Mokelumne, 1.43 in. per 100-ft. fall; Taboose and Oak, 0.46 in. per 100-ft. fall, and Bairs, 0.34 in. per 100-ft. fall. The author stated that it is not increasing elevation alone which causes increase in precipitation, but broad, rising slopes which give an upward movement to bodies of moist air driven by prevailing winds.—*Jour. Elec. Power and Gas*, July 8.

## BOOK REVIEW.

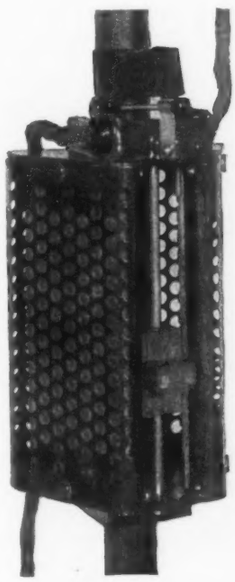
STORAGE BATTERIES. By A. E. Watson, E. E., Ph. D. Lynn, Mass.: Bubier Publishing Company. 166 pages, 63 illus. Price, $1.50.

This is an elementary practical treatise on the theory, construction and operation of storage batteries, adapted for the use of electrical artisans, storage-battery attendants and the public interested in electrical apparatus. The book, which is 17.5 cm x 13 cm x 1.3 cm, small enough for a large pocket, is thus well adapted for the storage-battery attendant's use.

# New Apparatus and Appliances

## SPOT-LIGHT DIMMER.

Portable incandescent spot lights (usually rated at 100 cp) have come into extensive use in theaters in recent years. Several makeshift types of resistances have been used for dimming, but all have been rather bulky and have other objectionable features. The Cutler-Hammer Manufacturing Company, of Milwaukee, has put on the market a new spot-light dimmer by means of which a wide range in brilliancy can be secured in the most convenient and accessible manner. This dimmer, unlike the "Simplicity" dimmer plate made by the same company, is mounted on and partly embraces the upright pipe standard of the lamp. It takes up a minimum amount of space, does not project bulkily and has no exposed live parts. The fiber handle travels on a guide rod in a slot in front of the frame, and the contact buttons are on the inside, mounted directly upon the units by through screws. They are, therefore, directly connected to the resistance wire. The weight of this dimmer is only a little over 5 lb. and its over-all height only 10 in. Twenty steps and an "off" point are provided.



Spot-Light Dimmer.

## OIL CIRCUIT-BREAKERS.

The rapid growth in recent years of high-tension transmission systems has developed a demand in many places for apparatus capable of being installed out of doors. A logical result of this was an outdoor-type high-tension switch for controlling the circuit, and the Westinghouse Electric & Manufacturing Company has met this demand by a modification of its type GA oil circuit-breaker, which has been most successfully used for some years past.

The breaker itself is the same as the indoor type with a weatherproof protection for the operating mechanism and terminals as shown in the accompanying illustrations. The breaker is made for either hand or electrical operation, automatic or non-automatic, for use on circuits of from 44,000 volts to 110,000 volts, 300 amp capacity.

Each pole is a separate and distinct unit and a multipolar breaker consists of two or more units connected together by the operating or pull rods working the contacts and tripping mechanism. The tanks are made of heavy welded boiler-sheet iron with an insulating lining. Each tank is provided with a cast-iron cover securely bolted to a flange riveted to the upper edge of the tank upon which is mounted the operating mechanism. The tank is filled with a high-grade insulating oil, the height of which may be determined by a sight gage near the top of the tank. Where the pull rod passes through the tank it is surrounded by a stuffing box which acts as a wiper and removes the oil from the rod and prevents its being thrown over the operating mechanism—a point that will be greatly appreciated by operators.

The upper or fixed contacts are firmly secured to the lower ends of the leads, which are of the well-known condenser type of the Westinghouse company. This upper contact consists of a circular piece of brass of greater area

than the moving contact, which insures the entire surface of the latter bearing upon the stationary upper contact. With this construction the necessity of accurately centering the contacts one upon the other is eliminated. The lower or movable contacts are carried by a heavy metallic cross-bar and consist of pieces of cylindrical brass rod backed by compression springs which insure alignment.

Electrically operated breakers are equiped with operating coils wound for direct current at standard voltages. They are also equipped with a tell-tale device consisting of a double-throw knife switch and colored lamps which indicate the position of the contacts. The automatic breaker may be tripped by current from standard series transformers, mounted at any convenient point, or special transformers built around the leads of the breaker. The latter method is considered standard and is usually employed when the tripping current is 100 amp or over. Another method of tripping is furnished by a series relay which operates in connection with springs to trip the breaker. This device is suspended from high-tension insulators immediately above the breaker and an insulating mechanical connection is made to the breaker. The actual power for tripping is furnished by springs which are compressed when the breaker opens, the relays being required to trip only the latch releasing the springs.

In order to adapt these breakers to outdoor use a housing is placed over the operating mechanism and rain shields over the condenser terminals. The housing over the operating mechanism consists of a cast-iron cover which is cast into and forms an integral part of the cover of the breaker. It is cast in two parts, which are securely bolted together, and hinges are provided which permit the upper portion to be raised for the purpose of inspection of the mechanism. In the electrically operated type of breaker the operating solenoid is also protected by means of a cast-iron housing, and the operating leads are brought out through brass bushings, thus permitting the use of lead cables and wiped joints. With this type of breaker there is also furnished a small knife switch mounted under the housing for controlling the incandescent lamp, which may be placed at any convenient point to indicate the position of the circuit-breaker contacts.

The condenser type terminal lends itself very readily to weatherproof protection by means of porcelain rain shields. These shields are porcelain petticoat insulators slipped over the terminals and securely fastened thereto. This construction is clearly shown in the accompanying illustration. The shields are secured to the terminal on the inner side by a waterproof gum and on the outer side where exposed to the weather by a waterproof cement. This form of construction prevents absorption of any moisture by the terminals and renders them entirely waterproof.

Fig. 1—Three-Phase, 88,000-Volt Outdoor Oil Circuit-Breaker.

A large number of this type of outdoor breakers have been installed on the lines of the Southern Power Company. One of the particular applications this company has made is the use of the breakers as sectionalizing switches in parallel lines of loops which have been built to insure continuity of service. By this means a defective portion of a line can be cut out and a good line cut in without any interruption to the service, which, of course, would not be possible by the use of disconnecting switches alone. Some of these breakers are also used in testing the lines to locate trouble and in such use are often thrown on short-circuit or dead grounds and are thus subjected to very severe service, but they have withstood such tests in a manner entirely satisfactory to the engineers of the operating company. On the 100,000-volt double-circuit steel-tower trunk line which feeds several of the larger towns in North Carolina the company desired some means of supplying certain customers from either one of the two lines which might or might not be operating in parallel. This was accomplished by using two outdoor-type oil circuit-breakers and mechanically interlocking them so that one breaker could be closed at a time—in effect, a three-pole double-throw breaker. This arrangement renders it impossible for the operator to throw the two lines together.

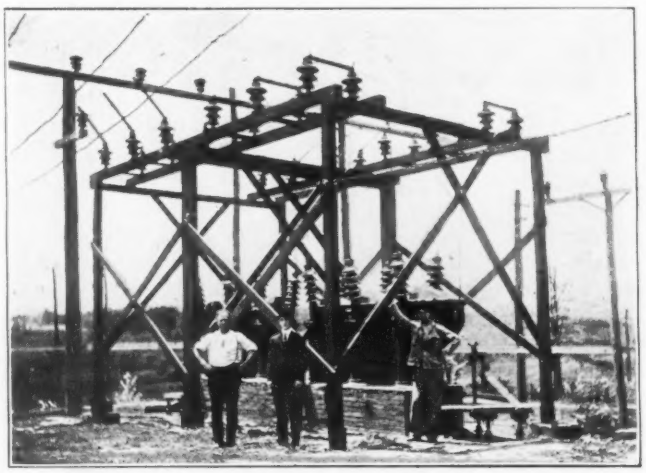


Fig. 2—Oil Circuit-Breaker on Southern Power Company's Lines.

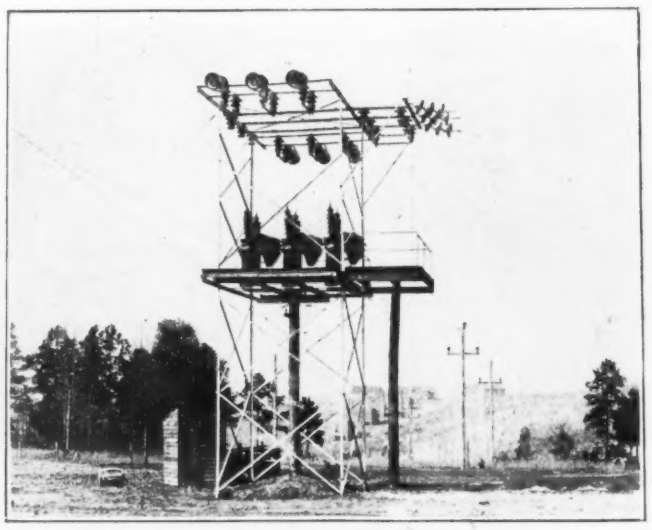


Fig. 3—Oil Circuit-Breaker Mounted on Steel Tower.

## ALTERNATING-CURRENT SWITCHBOARDS OF SMALL CAPACITY.

The increasing demand for alternating-current switchboards of moderate capacity and price has caused the Westinghouse Electric & Manufacturing Company to extend its line to cover a wide range of switchboard applications. One type of panels is particularly adapted for use in small central stations and isolated plants operating at voltages between 1100 and 3300. This type of switchboard embodies all the essential features required for satisfactory operation. Each panel consists of a black, marine-finished marble slab, which is unaffected by oil, containing the controlling and indicating apparatus, which is mounted on a gas-pipe framework.

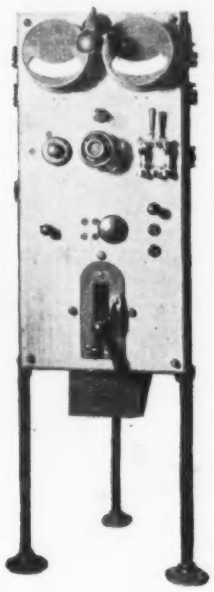


Fig. 1—Switchboard Panel.

The framework is composed of two 1¼-in. gas-pipe uprights, each fitted with flanges for bolting to the floor and connected at the top by a continuous wrought-iron strap of 1⅜-in. x ½-in. cross-section, which runs the full length of the switchboard framework. This construction insures perfect alignment of the panels and rigidity of structure. Pipe sockets for wall braces are supplied with the frame. The total height of the frame is 76⅜ in.

The marble panels are 48 in. high, 1½ in. thick, with ⅜-in. bevel on the front edges. The width depends upon the amount of apparatus to be mounted on the panel, and varies from 16 in. to 32 in.

The instruments furnished with this type of switchboard are Westinghouse Type K ammeters and voltmeters, utilizing the principle originated by Lord Kelvin. The voltmeter is used either to indicate voltage of the circuit or to determine the extent of a ground. This is accomplished by means of a combined voltmeter and ground-detector outfit, consisting essentially of plug switches and a voltage transformer. This device eliminates the extra expense of a special ground-detector instrument. A non-automatic oil switch is recommended for the control of the generator circuit.

Three styles of feeder panels are listed, each having the equipment as follows: 1. Non-automatic oil switches, with fuses mounted on the panel. 2. Non-automatic oil switches, without fuse protection, fuses to be provided by the customer. 3. Automatic oil switches, eliminating the necessity of fuse protection.

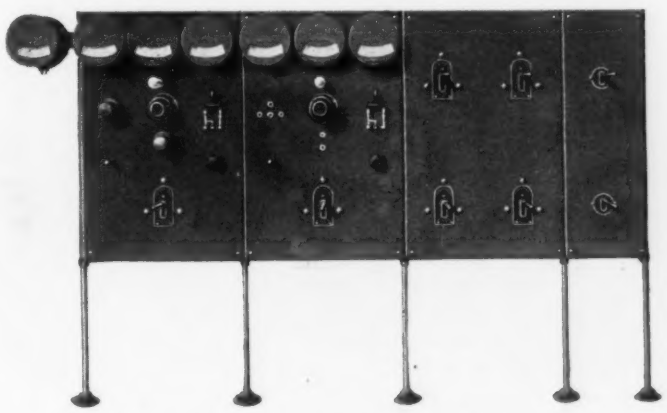


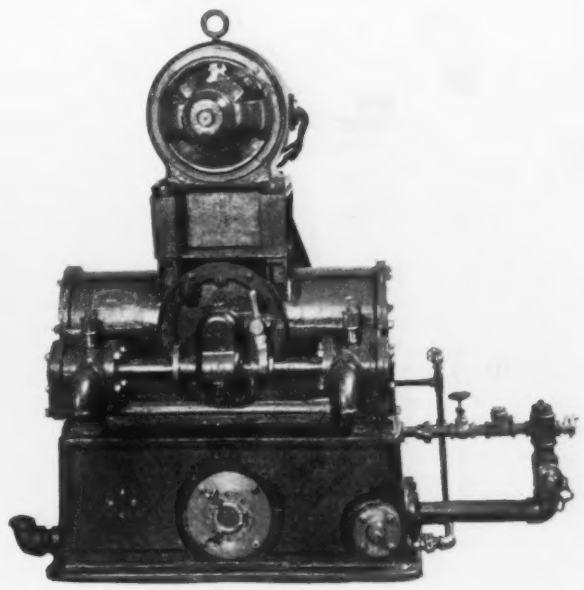
Fig. 2—Alternating-Current Switchboard.

The panel sizes and detail parts are such that they can be packed for mule transportation, making this type of switchboard preferable for installation in places which are not readily accessible for larger panel construction.

## ROTARY-VALVE VACUUM CLEANER.

The vacuum cleaner shown in the accompanying illustration is designed for residence and apartment-house use, but embodies the general principles and advantages of the larger outfits also made by the American Rotary Valve Company, 156 North Dearborn Street, Chicago. In these machines the valves used on the air cylinders are of the Moorhead rotary type, being positively driven through bevel gearing from the main shaft. By a very simple adjustment the machine can be converted from a vacuum pump into a compressor or vice versa. The cylinder is also arranged with a patented "unloading" device by means of which the delivered air pressure or vacuum may be set at a given value which is automatically maintained regardless of changes in demand on the machine. The bed of the machine serves as a combined air-washer and receiver for absorbing variations in demand of air pressure or vacuum. The base is a hollow casting filled with water to a depth of several inches. Air drawn from the vacuum-cleaner outlets enters this base and passes through the spray created by a rapidly revolving paddle wheel which washes the air, cleaning it of entrained matter before it enters the pump mechanism. To empty the base the pump is converted into a compressor, and by compressed air the contents of the basin are blown into the sewer through the drain connection provided. A special feature of this machine is the scrubbing service which can be carried on at one or more outlets while other outlets are used for dry-vacuum cleaning. After scrubbing the surface all water is quickly removed by the suction line. Another combination tool for use in removing dust from irregular surfaces where a vacuum alone is not applicable is provided with a compressed-air line, the air from which dislodges the dust, which is then removed by the suction.

The American Rotary Valve Company, maker of these outfits, has recently acquired the plant of the Jenney Electric Manufacturing Company at Anderson, Ind., and is now equipped to manufacture its own motors and control devices used in connection with its stationary vacuum-cleaning apparatus.



Rotary-Valve Vacuum Cleaner.

# Industrial and Commercial News

### The Week in Trade.

CHANGES of importance have been few in number and the waiting attitude still prevails, with trade showing minor advances or retrogressions in various parts of the country. Partial relief from the torrid weather of the previous week has improved individual sentiment with but slight reflection, however, in business affairs. Trade is dominated, apparently, by desire to defer action until the future can be gaged by actual crop returns, and as a consequence activity is on an extremely narrow scale and likely to continue so until harvest results are known. If this attitude is maintained it will probably be well into the fall before substantial improvement will be made. There seems to be no good season from the present standpoint why revival of trade should not become greatly accelerated at that time. Confidence and stability will grow with good harvests, and current reports predict, in the main, that yields will be satisfactory despite earlier impairment. Many railroad interests are expecting activity to follow the harvesting period and are said to be making plans accordingly. A feature of encouragement in the present situation is the improvement made in building operations during the month of June, the figures showing 11.5 per cent more business than in May of this year and 4.1 per cent more than in June, 1909. No decrease has taken place in the operations of the iron and steel trades, and from the large volume of inquiries and the closing of many delayed contracts for pig iron and finished steel indications point to further increase. Railroad earnings for the month of June are reported as showing a decrease of 1.5 per cent, which is not surprising in view of the relatively small freight tonnages and the increased costs of operation. Collections were irregular during the week and bank clearings were greatly improved. Business failures for the week ended July 13, as reported by *Bradstreet's*, were 196, as compared with 180 for last week, 202 for the same week in 1910, 206 in 1909, 258 in 1908 and 177 in 1907.

### The Copper Market.

SUCH improvement as was caused by the report of the Copper Producers' Association for June disappeared early in the week, and the trade returned to its former dullness. With the majority of domestic consumers apparently well supplied for present requirements and out of the buying, the outlook for increased business from this source is exceedingly poor. Conditions abroad indicate improvement, and the present movement shows a tendency to carry larger stocks. A weaker tone in prices for electrolytic and lake copper appeared during the week in company with the quieter market, but the price shadings have been chiefly among the smaller dealers, who are reported as making prices from five to ten points under the prevailing quotation of 12¾ cents. Standard copper was very dull at New York during the week, and the net advance in London was small, being 2s. 6d. on spot and futures, while offerings of electrolytic abroad at £58 10s. brought but few orders of any magnitude. The slump in the market at this time is regarded as exceedingly unfortunate, in view of the fact that prices have been in the ascendency and thought in a fair way to reach record levels. The present status of the copper trade, in view of the continuation of heavy production, seems to show need for either a further reduction in prices as a stimulation to consumption or a large increase in consumption as a result of improvement in all lines of trade throughout the country. Foreign trade for the first six months of the year shows total exports of 158,074 tons, which represents an increase of 28,850 tons over the shipments for the same period in 1910 and approaches within some 6000 tons the record shipments in the first half of 1908 of 163,871 tons. Exports for the month, including July 18, were 17,971 tons. The daily call on the Metal Exchange July 18 quoted copper as per the accompanying table.

| Standard Copper. | Bid. | Asked. | Settling Price. |
|---|---|---|---|
| Spot | 12.10 | 12.30 | ..... |
| July | 12.10 | 12.30 | 12.20 |
| August | 12.10 | 12.30 | 12.20 |
| September | 12.10 | 12.30 | 12.20 |
| October | 12.10 | 12.30 | 12.20 |

The London market, July 18, was as follows:

| | Noon. £ s d | Closing. £ s d |
|---|---|---|
| Standard copper, spot | 56 13 9 | 36 13 9 |
| Standard copper, futures | 57 5 0 | 57 5 0 |

Extreme fluctuations for this year:

| | Highest. | Lowest. |
|---|---|---|
| Standard | 12.35c | 11.57½c |
| London, spot | £57 10 0 | £53 7 6 |
| London, futures | 58 2 6 | 54 0 0 |
| Best selected | 61 10 0 | 57 5 0 |

### Industrial and Commercial Notes.

**Personnel of Republic Railway & Light Company.**—All matters attendant to the formation and operation of the Republic Railway & Light Company have been completed and the company is now established in its offices at 60 Broadway, New York City. The officers of the company are: James Parmalee, president; De Forest Candee, vice-president; George A. Galliver, vice-president and treasurer; G. F. Ravenell, secretary. The executive committee is composed of the following: Henry H. Wehrhane, chairman; Anson W. Burchard, Samuel McRoberts, George A. Galliver and Harrison Williams. The following compose the board of directors: J. J. Bodell, of Bodell & Company, bankers, Providence, R. I., and director American Textile Company; R. E. Breed, president American Gas & Electric Company; Anson W. Burchard, assistant to president General Electric Company; De Forest Candee, president Federal Utilities, Inc.; Norman McD. Crawford, president Mahoning & Shenango Railway & Light Company; George A. Galliver, director Federal Utilities, Inc.; Myron T. Herrick, president Society of Savings, Cleveland, Ohio; Parmeley W. Herrick, director Cleveland Electric Illuminating Company; Samuel McRoberts, vice-president National City Bank, of New York; James Parmelee, president Cleveland Electric Illuminating Company; Thomas A. Reynolds, assistant cashier National City Bank, of New York; Henry W. Wehrhane, Hallgarten & Company, bankers, and executive committee American Gas & Electric Company; Harrison Williams, American Gas & Electric Company, Federal Light & Traction Company, Federal Utilities, Inc., and president Springfield Railway & Light Company, of Springfield, Mo.

**Enlargement of Desert Power & Water Company.**—The annual meeting of the stockholders and directors of the Desert Power & Water Company was held at the office of the corporation at Kingman, Ariz., on July 8, at which the following officers were elected for the ensuing year: F. A. Wilde, president; James H. Davidson, vice-president; F. A. Wilde, Jr., treasurer and general manager; W. A. Richardson, secretary. The officers, together with W. L. Peters, of Riverside, Cal., constitute the new board of directors. Contracts will at once be let for the enlargement of the present engine and boiler rooms and the installation of an additional 1250-kw direct-connected generator and two 1000-hp boilers, with auxiliary apparatus. This will be the third addition to the plant within two years. Transmission-line extensions are also being considered. This company supplies power to the largest mines in the district as well as power and light to the city of Kingman. Its policy is to insure its patrons absolutely dependable service by having in reserve an ample electrical and mechanical equipment immediately available should any cause necessitate its use. With the improvements now under way the company will have the largest and best equipped central station in Arizona.

**Catskill Aqueduct Contractors to Employ Electricity.**—The New York Edison Company has signed contracts with the Pittsburgh Contracting Company, 3785 Broadway, New York, for 4500 hp to be used for electric drills on that portion of the Catskill Aqueduct in New York City extending from University Heights to Central Park, and with Grant, Smith & Company and Locher, 25 West Forty-second street, for 3000 hp to be used for various purposes on that portion of the aqueduct extending from Central Park to Union Square. Work has just begun on both contracts.

**Western Electric Business for June.**—A decrease of approximately 4 per cent is shown in the sales of the Western Electric Company for the month of June, compared with 1910.

**Fight for Control of Westinghouse Electric & Manufacturing Company.**—The annual meeting of the Westinghouse Electric Manufacturing Company will be held at the chief office of the company in East Pittsburgh on Wednesday, July 26, at 10 o'clock a. m. for the election of directors and for the transaction of other business. All of the former non-assenting stock of the company having been exchanged for assenting stock, which now constitutes the only class of the stock of the company outstanding other than the preferred stock, a resolution will be considered and acted upon that the assenting stock be hereafter denominated common stock. Further contention for control of the company is shown in a circular letter issued to stockholders by Charles J. Canda, who is a large holder of the assenting stock of the company and who was a member of the shareholders' committee which was formed to further the rehabilitation of the company about three years ago. The letter requests stockholders to send proxies to George Westinghouse for use at the meeting announced above. Mr. Canda in his letter charges that in the reorganization of the company in 1908 the personnel of the board of directors was dictated by the bankers, thus ignoring the rights of the shareholders to receive reasonable dividends. At a recent meeting of the directors a proposal by Mr. Westinghouse was voted down which asked for quarterly dividends of 1 per cent, requiring only 4 per cent out of the 13 per cent of net earnings which were made by the company on its assenting stock over and above all fixed charges and the 7 per cent dividend on the preferred stock during the last fiscal year. Mr. Canda states that the company is in excellent financial condition and has a large cash fund ($6,634,677) on deposit in the banks. During the two last fiscal years the net income of the company has aggregated $7,941,770. There are sixteen directors, of whom only four are to be elected on July 26, and he suggests that these new directors should be elected to represent the assenting shareholders. In conclusion Mr. Canda says that Mr. Westinghouse's interests are entirely with the assenting shareholders and that he is earnestly desirous of making their property valuable.

This was followed by a letter by George Westinghouse, in which the writer stated his profound conviction that the recent policy and management of the company has been ill-advised and detrimental, that the rights and just expectations of the stockholders have been disregarded, and that a change of policy and management is imperative. A rejoinder by members of the merchandise creditors' committee states that the proxies sought by Mr. Canda and Mr. Westinghouse are to be voted against the re-election of the following directors: Messrs. Charles F. Brooker, James S. Kuhn, Edwin F. Atkins and E. M. Herr. The report alleged that the desire to replace these directors is solely because they have not as yet seen fit to declare a dividend on the assenting stock, and adds that the payment of liberal dividends is not the only or best evidence of good management. The failure of the company in 1907 is attributed in part in this letter to the maintenance of high dividends, while at the same time large investments were being made in foreign manufacturing companies which resulted in heavy losses. The present board of directors, the letter says, thought it wise to take these losses into account, and owing to this financing, together with certain short-time obligations and improvements to plants, etc., to defer to a later day the resumption of dividends on this assenting stock. The letter concludes with an expression of confidence in the present board, and a statement that the interests of the assenting stockholders are being wisely served.

Robert Mather, chairman of the board of directors, replied on July 19 to the criticisms of the present administration, saying that the implications conveyed by Mr. Westinghouse are unwarranted. Mr. Mather states further that the fifteen members of the board of directors, aside from Mr. Westinghouse, own in the aggregate, either personally or through corporations whose holdings they represent, more than 58,000 shares of the company's assenting stock; that members of the board were creditors of the company at the time of the receivership, and as such had power to force a sale of the company's assets and thus absolutely to destroy the then outstanding stock and to deprive the then stockholders of their entire interest in the company. It was through their forbearance in accepting, Mr. Mather adds, through the working out of the readjustment plan, shares of assenting stock at par in payment of their claim that Mr. Westinghouse and other stockholders now have any interest in the company; and the determination that the best interests of the company require for the present postponement of dividends is as directly a financial loss to themselves as to the other stockholders.

**J. G. White & Company, Ltd.**—The annual report of J. G. White & Company, Ltd., of London, recently presented at the company's twelfth ordinary general meeting by its chairman, Mr. J. G. White, shows the phenomenal success of an engineering firm of American origin, though operating entirely as a British company. The English company is the direct outcome of the successful operations of J. G. White & Company, Inc., of New York, in foreign territory. Organized in 1900, the English company was equipped to undertake the largest problems in the field of consulting, designing and supervising engineering and construction as well as the operation of public-service properties and participation in financing such properties. The English company has this year declared a total dividend of 12 per cent on its preferred stock and 62 per cent on its common stock, after which the net earnings for the year have been sufficient to write off the balance of "purchase of business" account and increase the special reserve and surplus account to an amount equaling the total dividends paid. This has been done after making ample provision for contingencies and without writing up the value of securities owned. Some of these securities have increased materially in value in the year, so that even greater profits were actually made, although not realized, and, consequently, not considered as earned. The market value of the ordinary shares, par value £1, has increased from £1 6s. in 1906 to £7 4s. in 1911. The chairman in his report stated in part: "The net profit for the year amounts to £91,466 as against £64,801 for last year; the quick assets of the company, in the form of cash and loans against securities, amount to £136,331, an increase of about £18,000 over the figures shown in the preceding year. This quick-asset item is nearly double the total single-creditor item on the other side of the balance sheet. The figure for investments stands at £150,781, which is also considerably more than twice the company's total debts. This item shows an increase of approximately £28,000 over last year."

**Report of Mexican Light & Power Company, Ltd.**—The sixth annual report of the Mexican Light & Power Company, Ltd., shows that the business of the company during the year has exhibited satisfactory increases, thus fully warranting the extension of work on the Necaxa reservoir and other improvements authorized and commenced in 1909. The net revenue for the year 1910, after paying all expenses and fixed charges, was $1,456,612. This, together with $149,385, the balance brought forward from 1909, and $163,004 set aside from the profits of 1909 to provide for the accrued portion of the quarterly dividend paid Jan. 15, 1910, on the common stock and the accrued portion of the semi-annual dividend on the preferred stock paid May 1, 1910, makes a total credit balance of $1,176,002. Of this, the sum of $860,150 was paid to stockholders, representing a dividend of 7 per cent on the preferred stock and 4 per cent on the common. The balance carried forward to profit and loss account is $745,848, and the reserve account remains at $377,883. All branches of the business of the company are reported for the year as in excellent condition, and it is further remarked that the relations between the company and the federal, state and city officials in Mexico are most harmonious.

**Gigantic Southern California Merger.**—According to a newspaper dispatch, Henry E. Huntington has arranged a merger of the electric lighting and power properties of Los Angeles and adjoining sections of southern California, involving an ultimate bond issue of $50,000,000, of which $10,000,000 has already been subscribed in New York. The plan includes a hydroelectric development of several hundred thousand horsepower in Big Creek in Fresno County. Inquiry in New York of interests identified with the properties mentioned brought no confirmation of the news, though such a merger was considered probable.

**Canton Electric Company's Record Earnings.**—In the twelve months ended May 31 the gross earnings of the Canton Electric Company, of Canton, Ohio, were the largest in the history of the company. Total income was $294,490, and operating expenses were $134,841, leaving net earnings of $159,649. Bond interest was $53,750; after deducting this amount the balance available for dividends was $105,899. From this preferred dividends at the rate of 6 per cent were paid, amounting to $15,000, leaving a balance of $90,899 available for dividends on the common stock.

**Baltimore Machine Products Company Absorbs Viaduct Electric Company.**—The plant and business of the Viaduct Electric Company at Relay Station, Baltimore, Md., has been merged into the Baltimore Machine Products Company, which was recently incorporated under the laws of Maryland for this purpose. The officers of the new company are as follows: President, Senator A. P. Gorman, Jr.; vice-president, E. C. Mayo; treasurer, Conway S. Hodges; secretary, Dr. W. R. Eareckson. The Viaduct company was one of the oldest concerns manufacturing telegraphs and telephones in the country. When started, as Davis & Watts in 1871, its output was at first confined to telegraph instruments and district-messenger call boxes. A few years later the manufacture of magneto telephones was taken up, and the firm became a licensed manufacturer of the American Bell Telephone Company, continuing in this capacity until 1883. In 1884 the Viaduct Manufacturing Company was formed with A. G. Davis as president, and the plant was removed to Relay Station in the outskirts of Baltimore. The manufacture of fire alarms was next added to the list of its products, as well as switchboards, both for telephone and telegraph systems, the Postal Telegraph Cable Company for many years using a large part of the output of the Viaduct works. In 1894 the entire plant was destroyed by fire and temporary quarters were taken in Baltimore until 1896, when a new plant at Relay, with eleven new buildings and equipped with new machinery, was occupied. Owing to competitors springing up on all sides, in time a great deal of patronage was diverted to other concerns that had adopted more modern methods of doing business, and in 1907 the inevitable occurred, when at the first pinch of the panic the company was forced into the hands of a receiver and was then succeeded by the Viaduct Electric Company, which operated the plant for four years and made many improvements, both in equipment and methods of manufacture. The friends of the old company were loyal, and orders increased to such an extent that the company, having a limited capital and being burdened with a heavy load of assumed mortgages, has turned the entire plant over to the Baltimore Machine Products Company. Many more improvements are being made by the new organization, including new machinery and increased facilities for turning out its product in a modern way.

**Westinghouse Equipment.**—Among recent orders for railway equipment received by the Westinghouse Electric & Manufacturing Company are the following: For the Piedmont Traction Company, Charlotte, N. C., a quadruple equipment of railway motors and special non-automatic control, these motors being insulated for operation on 1500 volts; for the Oakland Traction Company, Oakland, Cal., ten equipments of type HL, non-automatic, unit-switch control; six double equipments of No. 323 railway motors with type K-10-A control, for the Springfield Traction Company, of Springfield, Mo.; for the San Francisco, Oakland & San José Railroad Company, San Francisco, Cal., twenty-five double equipments of No. 302 railway motors, type M control; five quadruple equipments of railway motors for operation on 1500 volts, with special non-automatic, unit-switch control, for the Greenville, Spartanburg & Anderson Railway Company, Charlotte, N. C.; for the Knoxville (Ill.) Electric Light & Power Company, one 150-kw, three-phase, 2300-volt, 60-cycle, 600-r.p.m. belted alternating-current generator with exciter; one 50-kw, three-phase, 2300-volt, 60-cycle, 1200-r.p.m. belted alternating-current generator with exciter and one five-panel switchboard; and for the Lena (Ill.) Electric Light & Power Company, two 75-kw, three-phase, 2300-volt, 60-cycle, 900-r.p.m. belted alternating-current generators with exciters and switchboard.

**Canadian Wagner Company.**—The Wagner Electric Manufacturing Company, of St. Louis, has announced the formation of the Wagner Electric Manufacturing Company, Ltd., of Canada, under a Dominion charter, with a capital stock of $50,000 fully paid. The Canadian corporation becomes the exclusive Canadian licensee under patents owned and controlled by the St. Louis company. Alfred Collyer, who for many years, as representative of Wagner interests in Canada, has been largely responsible for the volume of Wagner business there, has been appointed manager of sales of the new company. Various alternating-current apparatus in which the Wagner company specializes, including the new unity power-factor and adjustable-speed motors, have been patented in Canada, and the new Canadian Wagner company will proceed to manufacture and popularize these in Canada along the same lines as the St. Louis company does in the United States. The officers of the new company besides Mr. Collyer are: S. M. Dodd, president; W. A. Layman, vice-president and general manager; W. S. Thomas, treasurer. The previous headquarters of the Wagner Electric Manufacturing Company in the Bell Telephone Building, Montreal, become the headquarters of the new company.

**Montreal Street Railway.**—Although not yet announced, it is stated on good authority that the Montreal Street Railway has made arrangements with a prominent Boston financial house in accordance with which the company will secure money for needed extensions and improvements and to take up some seven or eight million dollars now tied up in various lines. The Canadian Light & Power Company, which controls the Montreal Street Railway, will commence to deliver electric power in Montreal before the end of the month from its generating plant at St. Timothée on the Beauharnois Canal. The first 7500 hp unit will commence operating at that time and another similar unit will be shortly added, while within a year the company expects to be developing over 25,000 hp. Through the purchase of the Central Light, Heat & Power Company from the Carsley estate and the control of the Montreal Railway the Canadian Light & Power Company has demands for more power than it will be able to generate for a year or more.

**Bonus for Waterwheel Efficiency.**—Edward B. Ellicott, electrical engineer of the Sanitary District of Chicago, certifies in a communication of recent date that "Unit No. 3" in the hydroelectric station on the Chicago Drainage Canal at Lockport, Ill., has earned a bonus of $16,320 in accordance with the bonus and penalty clause of the specifications for the waterwheels in that plant. The specifications called for a guaranteed efficiency of 80 per cent, and provided a payment or a forfeiture of $1,000 for each one-quarter of 1 per cent in excess of or less than this efficiency as shown by test. At a test at Holyoke, Mass., the guaranteed efficiency was exceeded by 4.08 per cent, and the $16,320 bonus mentioned above was ordered paid to the makers of the unit, the Wellman-Seaver Morgan Company. The contract under which this was done was dated Dec. 14, 1908, and later minimum guarantees on waterwheels have been 83 per cent.

**Extensive Arc-Lighting Equipment for Chicago.**—In the execution of its contract with the city of Chicago to extend the city street-lighting system, the Sanitary District of Chicago is purchasing large quantities of electrical apparatus. It has already awarded a contract to the Waterbury Company for about $80,000 worth of underground cables, and one to the Clay Product Company for multiple-duct conduits to cost $17,900. For the 10,000 new arc lamps required (see *Electrical World* of April 13, 1911, page 894) it is said that the General Electric Company and the Stave Electrical Company are very close competitors. At this writing it is proposed that a trial order of 250 lamps be placed with each company. It is said that the Stave lamps are 130-hour lamps, and that the General Electric lamps are of the ninety-hour type. Both are powerful illuminants.

**Isthmian Canal Proposals.**—Circular No. 640 of the Isthmian Canal Commission, Washington, D. C., contains invitations for proposals for one turbo-generator unit, 500 kw, three-phase, twenty-five cycles, 2200 volts, mixed pressure, together with switchboard and auxiliaries, including fittings and valves for connections to exhaust-steam mains; also one 30-hp, 2200-volt, three-phase, twenty-five-cycle, squirrel-cage induction motor, the starting panel for this motor being included in the above-mentioned switchboard equipment; 1200 feet stranded triple copper conductor and 34 cable bells. Proposals will be received until Aug. 4, 1911.

**American Electric Company.**—The American Electric Company, of which P. C. Burns is president, announces that it has purchased the machinery, tools, equipment and patents of the bankrupt American Electric Telephone Company, of Chicago. The new company will make a complete line of telephone apparatus, and will use the factory building of the old American Electric Telephone Company at South State Street and East Sixty-fourth Street.

**Manila Electric-Light Plant in Market for Extensions.**—O. M. Shuman, Manila, P. I., has leased from the government an electric-light plant which he will extend considerably, and asks us to state that he is in the market for electrical supplies for power-house, lighting and power circuits, and would like to receive catalogs and price lists from manufacturers.

**Aluminum Notes and Prices.**—The aluminum market is quiet, with ingots for remelting held at 21@21½ cents spot No. 1, the base for large ingots, while rods and wire are held at 31 cents and sheets at 33 cents, prices being for July 18.

# Financial.

## THE WEEK IN WALL STREET.

EXTREME dullness has been shown in the dealings on the New York Stock Exchange, and on Saturday the sales were the smallest on any Saturday this year. Total sales for the week ended July 15 were 984,800 shares as compared with 1,081,929 shares for the previous week. Operations on the bond market are still under the scale of the earlier part of the year, and the large investment demand expected in July has not materialized. There seems to be little disposition shown on the part of bankers to float new issues on the market prior to increase of public interest. Prices drifted during the week with but few changes of moment. On Monday the trading was but little better than on Saturday, and in the early trading most of the issues usually active were practically neglected. Securities of roads that are expected to participate in the benefits of the large cotton crop were strong throughout the day. Toward the close the market declined, with the lowest prices of the day in the last hour. Tuesday's market was dull until very near the close, when advances were made on nearly the entire list, led by a rise of 3 points in Interborough-Metropolitan

NEW YORK.

| | July 11. | July 18. | Shares Sold. | | July 11. | July 18. | Shares Sold. |
|---|---|---|---|---|---|---|---|
| All. Ch..... | 8½ | 8½* | 100 | Int. Met., pf. | 50¼ | 55 | 12,500 |
| All. Ch., pf.. | 28* | 28* | ——— | Mackay Cos.. | 89* | 87* | 310 |
| Amal. Cop... | 69½ | 69⅝ | 19,600 | Mackay C.,pf. | 73⅞* | 74¼ | 200 |
| Am. D. T.... | 20½ | 20½* | ——— | Man. Elev... | 135* | 140 | ——— |
| Am. Loco.... | 41 | 41 | 135 | Met. St. Rv.. | 15* | 15* | ——— |
| Am. Loco..pf. | 109* | 108* | ——— | N.Y.&N.J.Tel. | 139½ | 139½* | ——— |
| Am. Tel. & C. | 80* | 80* | ——— | Steel, com... | 79½ | 79⅜ | 158,100 |
| Am. T. & T. | 138⅞ | 137⅜ | 7,500 | Steel, pfd.... | 118⅞ | 118¼ | 2,850 |
| B. R. T..... | 84 | 83 | 51,910 | W. U. T.... | 81 | 81½ | 10,800 |
| Gen. Elec.... | 163 | 161½* | 1,600 | West'h, com. | 76 | 75½ | 1,950 |
| Int. Met.... | 18 | 19¾ | 5,205 | West'h, pfd.. | 119* | 119* | ——— |

PHILADELPHIA.

| | July 11. | July 18. | | July 11. | July 18. |
|---|---|---|---|---|---|
| Am. Rys..... | 44 | 44* | Phila. R. T..... | 20¾ | 21⅞ |
| El. Co. of A..... | 12¼* | 12¼ | Phila. Elec..... | 17⅞ | 17⅞ |
| Elec. St. Bt'y..... | 54⅝ | 54½* | Phila. Trac..... | 86¾ | 87½* |
| Elec. St. Bt'y., pf.. | 30* | 30* | Union Trac..... | 50 | 52⅜ |

CHICAGO.

| | July 11. | July 18. | | July 11. | July 18. |
|---|---|---|---|---|---|
| Chi. City Ry.... | 186* | 186* | Chi. Tel. Co..... | 124½* | 123* |
| Chi. Rs., Ser. 1.... | 87½* | 90* | Met. El. Co..... | 27* | 27* |
| Chi. Rs., Ser. 2.... | 26 | 27⅛ | Met. El., pfd..... | 74⅞* | 75* |
| Com. Edison..... | 136 | 136⅞ | Nat'l Car..... | 114* | 113 |
| Chi. Subways..... | 3⅞ | 3¾ | Nat'l Car, pfd..... | 118 | 119* |

BOSTON.

| | July 11. | July 18. | | July 11. | July 18. |
|---|---|---|---|---|---|
| Am. T. & T..... | 138⅞ | 137⅝ | Mex. Tel..... | 4½* | 4 |
| Cum. Tel..... | 158* | 158* | Mex. Tel., pfd..... | 7* | 6½ |
| Edison E. Ill..... | 281¼* | 282 | N. E. Tel..... | 145 | 146 |
| Gen. Elec..... | 163 | 161¾ | W. T. & T..... | 20 | 20½ |
| Mass. E. Ry..... | 23½ | 23⅜* | W. T. & T., pf..... | 96* | 97½ |
| Mass E. Ry., pf.... | 95 | 93½* | | | |

*Last price quoted.
Shares sold for the week, July 10 to July 15.

shares as a result of news that settlement of subway matters might be expected very shortly. With the price changes came a short period of activity, maintained until the close. Incidents of the day included a decline in New York City 4½ per cent. bonds to 102½, whereas sales have been made at 104⅞ as against the issue price of 101⅞. Affairs in the stock market are as yet influenced chiefly by crop conditions. Advices from the agricultural districts in the early part of this week were favorable. The government's weekly weather report showed fair rainfall in Nebraska, Oklahoma and Kansas and lower temperatures in many crop sections where excessive heat had prevailed. Few changes of importance have taken place in the money market. Time money is held rather firmly, but demand is not heavy. Rates July 18 were: Call, 2½@2⅜ per cent.; ninety days, 2¾@3 per cent. The quotations in the tables are those at the close July 18.

## FINANCIAL NOTES.

**Illinois Valley Gas & Electric Company.**—The first annual report of the Illinois Valley Gas & Electric Company, of Chicago, was submitted to the stockholders on July 12. This company was organized a year ago to take over a number of electric-service and gas companies in the northeastern part of Illinois. The company has electrical generating stations in the cities and villages of Streator, Wilmington, Odell, Cornell, Grand Ridge, Henry, Lacon, Mendota and Havana, and it also has gas plants in Streator, Ottawa and Morris, with a number of electrical substations. In his report for the year ended May 31, 1911, President Samuel Insull reports that during the year the company constructed more than 77 miles of high-tension electric lines and acquired seven substations for use in connection therewith, enabling the company to distribute energy from economically operated stations. The territory now served is about 1790 square miles for electric service and a lesser area for gas service. The connected load on May 31, 1910, was the equivalent of 48,965 standard 16-cp lamps, whereas a year later the figure was 120,298 16-cp lamp equivalents. During the year the number of electric meters in use has increased from 1943 to 4265, and the number of gas meters and gas stoves in use also shows a substantial increase. Some electric-railway business is done by the properties owned by the company and the passengers carried increased from 677,964 for the year ended May 31, 1910, to 744,750 for the year ended May 31, 1911. The gross earnings for the year ended May 31, 1911, were $327,641, and the net earnings $79,415. From the latter amount $39,665 was paid for bond interest and $23,245 for preferred-stock dividends, leaving a balance of $16,503, which makes the surplus reported $66,503. Mr. Insull reports that the first year of the company's business demonstrates that there is a large amount of business offering in the territory served. Officers of the company are: President, Samuel Insull; first vice-president, Charles A. Munroe; second vice-president, John F. Gilchrist, secretary and treasurer, John H. Gulick; assistant secretary and treasurer, H. E. Addenbrooke.

**Orders Sale of Hudson River Power Companies.**—Decision has been handed down in the cases of the Hudson River power companies, which were financed by E. H. Gay & Company, the Boston banking house, whose failure in 1908, subsequent to the flotation of the project, was described in the *Electrical World* April 6, 1911, and referred to in the issue of June 8. The decision provides for consolidation of the eight companies involved and the sale of the consolidated companies under decrees which will be granted within a short time. In rendering its opinion the court outlined the plans of the promoters of the companies and their intention to develop gas and electric generating plants over a large territory in upper New York State and parts of Vermont, and then outlined the operation of the affiliated companies in part as follows: "For some years the plants were run under one management. Earnings of all companies were massed and used for the benefit of all. It is far from probable the equities between these several corporations could ever be known if they were sold as separate concerns. Connected and operated as one whole system, they are of great value. As single corporations some would be of little value. If separated and efforts were made to settle their rights between themselves, the litigation would be ruinous and well-nigh endless. There are also reasons growing out of the making of the mortgages, one company guaranteeing those of another, etc., which make the consolidation advisable." Most of the $10,270,000 first mortgage bonds and $5,446,600 outstanding stock of the companies is held by investors residing in New England.

**United States Telephone Company.**—At the recent annual meeting of the stockholders of the United States Telephone Company at Cleveland a reorganization was effected under the plan of the Morgan interests, with the election of G. R. Johnson and William F. Burdell, both of Columbus, as directors. Mr. Johnson is general manager of the company and Mr. Burdell is the vice-president of the State Savings Bank & Trust Company. These men take the place of Clarence Brown, of Toledo, who represented James A. Brailey, and Herman Stifel, of St. Louis, backer of the Continental Telephone & Telegraph Company, which was in the fight for the lines in Ohio. All the other officers and directors were re-elected. Charles A. Otis was re-elected president of the Cuyahoga Telephone Company and all the other officers also retain their places. J. B. Fay resigned as a member of the board of directors and M. C. Harvey was chosen in his place.

**Chicago Elevated-Railway Stockholders Prefer Cash.**—Of the 92 per cent of stockholders of the Chicago elevated railway companies who deposited their stocks under the Blair merger agreement now being worked out, it is reported that 86 per cent elected to be paid in cash rather than to receive 70 per cent of their holdings in cash and 30 per cent in preferred stock in the new company, with a bonus of 24 per cent of the new common stock. A cash payment of over $20,000,000 will be made to the owners of the old stock under the offer which has been made.

**Ohio Company Defaults Bond Interest.**—The Hamilton Gas & Electric Company, of Hamilton, Ohio, has defaulted on the coupons due July 1 on its $1,000,000 5 per cent bonds, not having earned the interest.

**Washington, Baltimore & Annapolis Securities.**—It has been announced that the new securities of the Washington, Baltimore & Annapolis Electric Railway Company, which are to be given in exchange for the present holdings of stock and bonds of the road under the reorganization plan, will be ready for distribution on July 24. The security holders will receive thir stocks and bonds from the Safe Deposit Company, of Baltimore, while other holders will be looked after by the Cleveland Trust Company, of Cleveland, Ohio. The directors at a meeting held in Cleveland last week authorized the officers of the company to have the new bonds and preferred stock listed on the stock exchanges of Baltimore, Washington and Cleveland. The larger part of these securities is held by persons outside of Baltimore. In all there are $5,000,000 of bonds, $1,460,000 of preferred stock and $3,000,000 of common stock. A matter of congratulation for the security holders, the officers and the receivers who have brought about the reorganzation plan is that the new company, since its organization on April 1, and for the period from April 1 to June 30 last, has made $30,000 clear above interest and taxes.

**Monterey Railway, Light & Power Company.**—The annual report of the Monterey Railway, Light & Power Company for the fiscal year ended Dec. 31 showed marked improvement in the affairs of the company. The surplus available for dividends on the common stock was equivalent to 4.25 per cent on the $4,100,000 stock outstanding, comparing favorably with the 3.25 per cent earned in the previous year. Substantial increase was made in gross, net and surplus earnings, resulting in a surplus of $174,286 at the close of the fiscal year. Considerable expense was entailed in consolidating the plants of the railway, light and power service, but the report justifies this by showing a decrease of 14 per cent in the cost of producing energy as a result thereof. During the year the company made a reduction of 10 per cent in its lighting rates, but the revenue for this class of service, however, was larger than in the previous year. A new-business campaign, aimed particularly at power users, is being carried on this year.

**Colorado Telephone Merger.**—The Tri-State Telephone Company has been merged with the Colorado Telephone Company. The former company operates in southern New Mexico and a small part of Arizona and is capitalized at $1,000,000. "The Colorado company will not issue additional stock at this time because of the merger," said E. B. Field, Jr., vice-president of the company. It is rumored that the Colorado Telephone Company may buy in the Rocky Mountain Bell Telephone Company and other Bell telephone companies in the Rocky Mountain region, thus giving to one company control of the lines throughout that section of the West. If this were done the Colorado Telephone Company would have lines from Canada to Mexico and probably to the Pacific Coast.

**Toronto Railway Company.**—The Toronto Power Company, a subsidiary of the Toronto Railway Company, which in turn is a Mackenzie and Mann interest, will pay $135 cash per share for the stock of the Toronto Electric Light Company, recently absorbed, payment to be made Aug. 1. At a meeting of the directors of the railway company on July 13 it was decided to issue to the shareholders $2,000,000 in stock at par, give a stock bonus of $1,000,000 and increase the dividend from 7 to 8 per cent per annum dating from July 1. In anticipation of such a decision the stock rose from $134 to $168 prior to the meeting of the directors. In addition, $1,000,000 of stock will be held in the treasury, the total increase of capitalization thus being from $8,000,000 to $12,000,000.

**Denver Gas & Electric Light Company.**—With further reference to the merger of the Denver Steam Heating Company, the Lacombe Electric Company and the Denver Gas & Electric Company into one company known as the Denver Gas & Electric Light Company, as mentioned in the issue of July 15, the new company has authorized an issue of $25,000,000 5 per cent bonds. Of this amount $8,000,000 are reserved to take care of an equal amount of Denver Gas & Electric Company bonds and of $900,000 bonds of the Lacombe Electric Company upon maturity. The balance of the issue will be available for improvements and additions to the properties.

**Electric Light Merger in Indianapolis Halted.**—Plans for the merger of the Indianapolis Light & Heat Company, the Merchants' Heat & Light Company and the People's Light and Heat Company have been halted temporarily because of a legal opinion to the effect that such a merger would be in violation of Indiana anti-trust laws. The three companies have agreed to the terms of the merger, but if the courts decide these to be illegal a new plan will be adopted. Each of the three companies is now operating on similar franchises providing that the maximum rate for electric lighting shall not exceed 10 cents per kw-hour, but in some instances three different rates for the same kind of service are in force.

**Chicago Railways Company.**—The Chicago Railways Company has just sold to a syndicate of financiers an additional block of $5,000,000 of the first-mortgage 5 per cent bonds secured under the open mortgage of Feb. 1, 1907, bringing the amount issued up to $45,955,000. The proceeds from these bonds will supply funds sufficient to complete all rehabilitation work on the company's lines. About 205 miles of track have been already relaid with 129-lb. rails, and the right-of-way has been almost entirely repaved. At present 1500 pay-as-you-enter cars are in operation and contracts for 215 more are to be placed soon.

**Commonwealth Edison Shares.**—There was considerable activity in the shares of the Commonwealth Edison Company in the stock market of Chicago last week. On July 13 the stock sold for 137¼, which was the highest price reached up to that time. The stock is on a 7 per cent basis. The intimate relation of the company with the merger of the Chicago elevated railway companies has no doubt affected the stock favorably, while the prospect of the formation of a great suburban electric-service company by the same interests may have also stimulated the demand for Commonwealth Edison stock.

**Earnings of Bell Telephone System.**—The statement of earnings of the Bell Telephone System in the United States, as given in the table below, refers to the report of the American Telephone & Telegraph Company and associated holding and operating companies in the United States, not including connected independent or sub-licensee companies, for five months ended May 31, 1911. All duplications, including interest, dividends and other payments to the American Telephone & Telegraph Company by associated holding and operating companies, are excluded.

### DIVIDENDS.

Commonwealth Edison Company of Chicago, quarterly, 1¾ per cent; payable Aug. 1.

Electric Bond & Share Company, quarterly, preferred, 1¼ per cent; payable Aug. 1.

Havana Electric Company, quarterly, preferred and common, 1½ per cent; payable Aug. 12.

### REPORTS OF EARNINGS.

| Period. | | Gross Earnings. | Operating Expenses. | Net Earnings. | Fixed Charges. | Net Surplus. |
|---|---|---|---|---|---|---|
| **AMERICAN TELEPHONE & TELEGRAPH COMPANY.** | | | | | | |
| 6m., June, | '11 | $18,203,624 | $1,782,461 | $16,421,163 | $2,805,884 | $13,555,278 |
| 6 " " | '10 | 17,595,895 | 1,694,485 | 15,901,410 | 2,586,355 | 13,315,055 |
| ***BELL TELEPHONE SYSTEM IN UNITED STATES.** | | | | | | |
| 5m., May, | '11 | $72,710,093 | $28,357,638 | $44,352,455 | $28,836,771 | $15,515,684 |
| 5 " " | '10 | 66,831,950 | 24,746,815 | 42,085,135 | 26,317,282 | 15,767,853 |
| **BLACKSTONE VALLEY GAS & ELECTRIC COMPANY.** | | | | | | |
| May, | 1911 | $82,628 | $41,907 | $40,721 | $29,691 | $11,030 |
| " | 1910 | 75,458 | 37,340 | 38,118 | 29,161 | 8,957 |
| **COLUMBUS ELECTRIC COMPANY.** | | | | | | |
| May, | 1911 | $40,417 | $17,308 | $23,109 | $10,690 | $12,419 |
| " | 1910 | 37,227 | 15,506 | 21,721 | 17,616 | 4,105 |
| **DALLAS ELECTRIC CORPORATION.** | | | | | | |
| May, | 1911 | $132,585 | $88,079 | $44,506 | $27,942 | $16,564 |
| " | 1910 | 115,592 | 81,398 | 34,194 | 26,621 | 7,573 |
| **GALVESTON-HOUSTON ELECTRIC COMPANY.** | | | | | | |
| May, | 1911 | $128,831 | $75,724 | $53,107 | $24,668 | $28,439 |
| " | 1910 | 103,823 | 66,318 | 37,505 | 23,547 | 13,958 |
| **LOWELL ELECTRIC LIGHT CORPORATION.** | | | | | | |
| May, | 1911 | $30,304 | $17,305 | $12,999 | $4,564 | $8,435 |
| " | 1910 | 32,847 | 20,358 | 12,489 | 4,635 | 7,854 |
| **MINNEAPOLIS GENERAL ELECTRIC COMPANY.** | | | | | | |
| May, | 1911 | $112,614 | $43,603 | $69,011 | $38,232 | $30,779 |
| " | 1910 | 93,626 | 40,626 | 53,000 | 31,157 | 21,843 |
| **NORTHERN TEXAS ELECTRIC COMPANY.** | | | | | | |
| May, | 1911 | $136,227 | $70,688 | $65,539 | $25,032 | $40,507 |
| " | 1910 | 117,766 | 64,484 | 53,282 | 19,722 | 33,560 |
| **SAVANNAH ELECTRIC COMPANY.** | | | | | | |
| May, | 1911 | $56,777 | $38,231 | $18,546 | $18,422 | $124 |
| " | 1910 | 53,379 | 34,307 | 18,072 | 18,020 | 52 |
| **SEATTLE ELECTRIC COMPANY.** | | | | | | |
| May, | 1911 | $447,989 | $256,821 | $191,168 | $114,889 | $76,279 |
| " | 1910 | 467,961 | 273,934 | 194,027 | 115,736 | 88,291 |

*See note, head of table.

# General News

## Construction News.

DOTHAN, ALA.—Application has been made to the City Council by Charles Dothan, of Troy, Ala., for a franchise to supply electricity in Dothan from the large power plant which he proposes to erect in Elba soon.

ELBA, ALA.—It is reported that Charles Henderson, of Troy, Ala., is contemplating the construction of an electric-light plant in Elba.

EUFAULA, ALA.—The City Council has decided to erect a municipal electric-light plant in Eufaula, to cost about $50,000. As yet the location of the power house has not been decided upon.

VALDEZ, ALASKA.—Plans are being prepared to equip the machinery at the Cliff mine for electrical operation. Electricity for operating the plant will be supplied by the Alaska Water, Light & Telephone Company, of Valdez, which is making arrangements to increase its output by the installation of an additional plant in Sulphide Canyon, near Camp Comfort. A transmission line is now being erected from the town to the proposed power station, which will later be extended down the bay to the Cliff. The present station of the company is located in Solomon Gulch.

BISBEE, ARIZ.—The plant and holdings of the Bisbee Light & Power Company were recently sold at a foreclosure sale to satisfy a mortgage held by the Los Angeles Trust Company, of Los Angeles, Cal., for $30,000. W. J. Ainsworth, of West Union, Ia., purchased the property.

KINGMAN, ARIZ.—Plans are being considered by J. H. Hays and Robert S. Waters for the installation of a hydroelectric plant on Trout Creek in the eastern part of Mohave County. Electricity generated at the plant will be transmitted to the mining districts in that section to operate the machinery in the mines and mills.

KINGMAN, ARIZ.—Contracts will soon be awarded by the Desert Power & Water Company for extensions and improvements to its plant, including the installation of additional machinery, consisting of one 1250-kw direct-connected generator and two 1000-hp boilers with auxiliary apparatus. Extensions will also be made to the transmission lines. The company supplies electricity for lamps and motors in Kingman and electrical energy to the largest mines in this district. F. A. Wilde is president of the company, and F. A. Wilde, Jr., is treasurer and general manager.

BROWNS VALLEY, CAL.—Preparations are being made by J. C. Campbell to equip the mines on the old Pennsylvania claim in Browns Valley for electrical operation. It is understood that orders have been placed for electrical machinery. At present oil is used for fuel.

FRESNO, CAL.—Work has commenced on the construction of a new substation by the San Joaquin Light & Power Company, about 10 miles west of Lemoore. The new substation, known as the Henrietta, will tap the Bakersville loop when finished, thus giving more direct connections for the Coalinga line and will give more efficient service for the Coalinga district and the oil fields region.

GREENVILLE, CAL.—It is reported that the Indian Valley Electric Light & Power Company is preparing for a water-power development and erection of a 25-mile transmission line, bids for which will be called for in about thirty days. The company is planning a development with a total output of 31,000 hp, which includes the plant at Greenville. The main offices of the company are located at 1116 Crocker Building, San Francisco, Cal.

LONG BEACH, CAL.—The Southern California Edison Company has awarded the contract for the erection of two steel towers for its transmission line, one at each side of the channel of the inner harbor, to the Security Construction Company, of Los Angeles, Cal., for $13,973.

LOS ANGELES, CAL.—Bids will be received at the office of the Supervising Architect, Washington, D. C., until Aug. 21 for the installation of a vacuum cleaning system in the United States court house and post office building at Los Angeles, Cal., in accordance with drawings and specifications, copies of which may be obtained at the above office or at the office of the custodian at Los Angeles, Cal. James Knox Taylor is supervising architect.

POMONA, CAL.—The Board of Supervisors has granted the Pacific Light & Power Company a franchise to erect a transmission line in the foothill district east of the city limits of Los Angeles and extending to Pomona to supply electricity for lamps and motors to suburban residents. The price paid for the franchise was $100.

PORTERVILLE, CAL.—Efforts are being made by the officials of the Tulare County Power Company to complete its central power plant on the upper Tule River by Sept. 1. Rights of way are being secured by the officers of the company for an electric railway, which will connect Porterville and Lindsay on the north and Tulare on the west, and which will tap the entire orange and dairy district of eastern Tulare County.

REDDING, CAL.—A mortgage has been filed by the Sacramento Valley Power Company in favor of the Anglo-California Trust Company for $2,000,000, to secure an issue of bonds of the same amount, of which the proceeds will be used to take up $400,000 of bonds of subsidiary companies, $600,000 for enlarging its plants and extensions of transmission lines, and $1,000,000 will be held in reserve. This company is a consolidation of the Sacramento Power Company, the Shasta Power Company and the Northern Light & Power Company. It has two power plants located near Lassen, each having an output of 2000 hp, both of which will be increased to 7000 hp. The transmission lines of the company will be extended to Willows and to a connection with the lines of the Great Western Power Company, from which it will purchase additional energy as needed. The company proposes to cover the field north of Redding. The Sacramento Power Company and the Great Western Power Company are controlled by the same interests.

SACRAMENTO, CAL.—The Sacramento Electric, Gas & Railway Company, it is reported, will erect a large building for its offices at the corner of Eleventh and K Streets.

SAN BERNARDINO, CAL.—Surveys are being made by the Nevada-California Power Company for the erection of a transmission line from its plant on Bishop Creek, in Inyo County, to San Bernardino for the purpose of transmitting electricity into Southern California for distribution. The proposed line will be about 240 miles in length.

SAN BERNARDINO, CAL.—Application has been made to the City Council by F. A. Worthley, superintendent of the municipal electric plant at Riverside, Cal., for a franchise to erect transmission lines for the distribution of electricity in this city. Mr. Worthley states that it is proposed to install a plant with an output of about 10,000 hp, which will probably be located in San Bernardino, at a cost of about $300,000. The company also proposes to erect high-tension lines through the Moreno and Perris Valleys to supply power to operate pumps for irrigation purposes. A transmission line will also be extended to the territory north of Corona. Franchises have been applied for in both counties. It is said that Mr. Worthley represents the California-Nevada Power Company.

SAN DIEGO, CAL.—Bids will be received by Allen H. Wright, city clerk, for the purchase of a franchise for the right to construct and operate an electric railway ending Sept. 1, 1952.

SAN DIEGO, CAL.—The Board of Park Commissioners has entered into an agreement with the San Diego Consolidated Gas & Electric Company whereby the company will supply electricity for the lamps and operating the pumps of the fountain in the plaza at a flat rate of $100 per month.

SAN JOSE, CAL.—The Peninsular Railway Company is preparing plans for the construction of an extension south from San Jose to Palo Alto toward Paraja. Five extensions of franchises were granted to the Peninsula Railway Company to build electric railways in various parts of Santa Clara County by the County Supervisors. These franchises cover about 12 miles of road.

SAN FRANCISCO, CAL.—Plans are being prepared for the installation of an electric-light system at Fort Miley, near San Francisco, Cal. The plant will supply electricity for lamps and motors for thirty-two buildings and for street lighting. The equipment will include transformers, lamp-posts, line material, etc. The cost of the system is estimated at about $20,000. For further information address Col. George McK. Williamson, care Constructing Quartermaster's Department, Fort Mason, San Francisco, Cal.

CLIFTON, COL.—Plans are being made by the residents of Clifton to incorporate the town for the purpose of securing electric-light and water-works systems.

COLORADO SPRINGS, COL.—An agreement has been entered into by the Colorado Springs Electric Light Company, the Colorado Telephone Company, the Western Union Telegraph Company and the Postal Telegraph Company whereby all electric wires, except trolley wires and their supports, will be placed underground on Tejon Street.

DENVER, COL.—Plans are being made by the Denver Gas & Electric Light Company for rebuilding the steam-heating plant and extending the mains of the Denver Steam Heating Company, which was taken over by the company recently. The cost of the work is estimated at about $500,000.

DENVER, COL.—The Board of Supervisors has passed an ordinance providing for a ten-year contract with the Denver Gas & Electric Company to supply incandescent street lamps at $20 each per year. Under the new agreement the company is to furnish electricity for lighting the streets and boulevards and to assume the expense of underground wiring and all materials necessary for installation. The city under the present contracts pays $28 per lamp per year and is required to pay

for all underground wiring. There are now about 1000 incandescent lamps in use and about 500 more will be installed.

DENVER, COL.—At a meeting of the directors of the Denver Gas & Electric Company, the Lacombe Electric Company and the Denver Steam Heating Company, held in Denver recently, it was decided to consolidate the three properties, to be known as the Denver Gas & Electric Light Company, the last-named company having been incorporated some time ago. Bonds to the amount of $25,000,000 have been authorized by the new company, of which $8,000,000 are reserved to take care of the same amount of bonds of the Denver Gas & Electric Company and $900,000 for bonds of the Lacombe Electric Company when they mature. The balance of the issue is to be used for improvements or additions to the system as they may be needed in the future. It is understood that none of the new bonds will be issued within the next few months.

FRUITA, COL.—Preparations are being made to install a hydro-electric power plant in the South Side ditch. The proposed plant will supply electricity in Fruita and the entire lower end of the Grand Valley.

GLENWOOD SPRINGS, COL.—The federal court has handed down a decision in favor of the Glenwood Light & Water Company, which holds that the city must live up to its contract with the company. The city of Glenwood Springs has issued bonds to buy the plant of the company, which the company refused to sell on the ground that it had an existing contract with the city which had not expired. By the terms of the decision the city will not be allowed to buy the plant or erect its own plant until the contract with the company expires, which has several years to run.

WINDSOR, COL.—Contract has been placed by the business men for the erection of ornamental lamp standards with tungsten lamps, to be installed on the two principal business blocks. The Northern Colorado Power Company is to pay half of the cost of installation. Post office address is New Windsor.

COS COB, CONN.—The New York, New Haven & Hartford Railroad Company has placed an order with the Bigelow Company, of New Haven, Conn., for twelve 625-hp Bigelow-Hornsby water-tube boilers for its new power station at Cos Cob.

MANCHESTER, CONN.—The South Manchester Light & Power Company has purchased the plant and holdings of the Manchester Light & Power Company, the latter company operating in the North End. Electricity for operating the system of the Manchester Light & Power Company has been supplied by the South Manchester Light & Power Company for several years.

MOOSUP, CONN.—The Nashawaug Electric Power Company, of Plainfield, Conn., has applied to the Selectmen for permission to erect its transmission line, which will connect the villages, across the town farm property.

NEW HAVEN, CONN.—The railroad committee of the General Assembly has reported favorably on several petitions of the Connecticut Company for extensions to its railway lines in New Haven and West Haven.

STAFFORD SPRINGS, CONN.—The Tolland County Street Railway Company, which was granted a charter several years ago, has recently organized to build an electric railway between Stafford Springs and Staffordville. The directors are: A. S. May, B. I. Spockland and N. S. Buckingham.

STAMFORD, CONN.—The Stamford Gas & Electric Company has recently issued $100,000 in capital stock, the proceeds to be used for extensions and improvements to its plant to provide for the increased demand for service.

WILMINGTON, DEL.—Plans are being considered for the installation of a new lighting system on Market Street. It is proposed to erect ornamental lamp standards and to place four tungsten lamps on each post.

WASHINGTON, D. C.—The Baltimore & Washington Transit Company has applied to the Public Service Commission of Maryland for permission to issue $50,000 in bonds. The company is planning to build an extension to Sandy Spring, Md., a distance of 14 miles.

WASHINGTON, D. C.—The Washington-Virginia Railway Company is reported to have leased the Bluemont branch of the Southern Railway Company for a term of ninety-nine years. Plans are being made by the Washington-Virginia Railway Company to equip the Bluemont branch for electrical operation and operate it in connection with the rest of its system.

ATLANTA, GA.—The Appalachian Power Company has applied to the Railroad Commission for authority to issue $250,000 in capital stock and the same amount in bonds. The company has acquired extensive water-power rights on Panther Creek in Habersham County, which it proposes to develop. Louis B. Magid, of Atlanta, Ga., is president of the company.

MARIETTA, GA.—Owing to the City Council and the Kennesaw Paper Company being unable to come to an agreement on the price to be charged for street lamps, application has been made to the Railroad Commission to fix a rate. The contract expired some time ago and the company wishes to increase the price for the service, which the city will not consent to.

PERRY, GA.—It is reported that bonds to the amount of $6,000 have been voted, the proceeds to be used for the installation of an electric-light plant.

WAYCROSS, GA.—Application has been filed by the Ware County Light & Power Company, of Waycross, Ga., with the Railroad Commission for authority to issue $20,000 in bonds, the proceeds to be used to erect a gas-generating plant.

NEZ PERCE, IDAHO.—A deal has been closed whereby A. Welsh and R. B. Montague, of Portland, Ore., have purchased the property of the Nez Perce Light & Power Company, which includes the Nez Perce water system, the high-tension transmission line to Vollmer and Ilo, now under construction, the light and power franchises in Ilo, Nez Perce and Kamiah and the power plant and sawmill on Lolo Creek, two miles above Greer. The consideration is said to be $70,000. The new owners, it is said, propose to develop the power plant at Lolo Creek to its full capacity and will at once enter the prairie field in competition with the Grangeville Electric Light & Power Company, which has a high-tension transmission line into Cottonwood, where it recently purchased the local system and is planning to extend its power line from there into Vollmer.

BLOOMINGTON, ILL.—Recommendation has been made to the Council by Seth S. Noble, superintendent of the municipal water and light plant, for the installation of additional equipment at the municipal electric-light plant. He states that the plant cannot carry the additional load contemplated by the installation of ornamental street lamps.

CHICAGO, ILL.—Sealed proposals will be received by the South Park Commissioners, Washington Park, Chicago, Ill., until July 26 for approximately 138 electric-light posts and thirty electric-light fixtures for concrete fence posts at Square Four, Forty-fifth Street and Princeton Avenue. J. F. Neil is secretary.

DELAND, ILL.—The Village Board has granted I. C. Bowsher a twenty-year franchise to construct and operate an electric-light plant in Deland.

DIXON, ILL.—The Westinghouse Electric & Manufacturing Company has sold to the Lee County Lighting Company, of Dixon, Ill., one 200-kw, three-phase, 2300-volt, 60-cycle, 600-r.p.m., revolving-field, alternating-current generator, belted, complete with exciter and switchboard.

GALESBURG, ILL.—The Retail Merchants' Association is planning to place arc lamps on top of the poles now being erected by the Galesburg Railway & Light Company.

LENA, ILL.—The capital stock of the Lena Electric Light & Power Company has been increased from $12,000 to $20,000.

MACKINAW, ILL.—The City Council, it is reported, has appointed a committee to investigate ornamental street lighting systems in other cities with a view of establishing an ornamental system in Mackinaw.

MACOMB, ILL.—The Macomb Electric Light & Gas Company is contemplating exchanging its present lighting system. The erection of concrete lamp standards is also under consideration by the merchants in the city.

OREGON, ILL.—Arrangements are being made by the Oregon Light & Power Company to extend its transmission lines to Ashton, where it has been granted a twenty-five-year franchise by the Village Board. The line will be extended from the Oregon-Franklin Grove line at Brown's Corners.

PONTIAC, ILL.—The Pontiac Light & Water Company, of Pontiac, Ill., has purchased from the Westinghouse Electric & Manufacturing Company one 300-kw, three-phase, 2300-volt, 600-r.p.m., alternating-current generator, belted, with direct-connected exciter and three-panel switchboard.

QUINCY, ILL.—The contract for installing 118 ornamental lamp standards, each carrying five tungsten lamps, was awarded to the J. W. Turner Construction Company, of Des Moines, Ia., by the Civic Improvement League.

QUINCY, ILL.—The Mississippi River Power Company has secured the right-of-way through Adams County for its proposed interurban railway. The company proposes to build a belt line from Rock Island to St. Louis. The Stone & Webster Engineering Corporation, of Boston, Mass., has the contract for building the railway.

QUINCY, ILL.—Arrangements are being made for organizing a company for the purpose of building an electric railway from Quincy to Niota, Ill., with branches to Keokuk, Ia., Warsaw, Carthage and Nauvoo, Ill. The company will be incorporated under the name of the Quincy & Western Illinois Electric Company. The capital stock will be placed at $5,000. Henry Dayton, of Quincy, Ill., has been elected president.

ROCK ISLAND, ILL.—The City Council has adopted an ordinance permitting the Central Union Telephone Company to purchase the property of the Union Electric Telephone & Telegraph Company. The consent of the Moline Council has not yet been secured.

WHITEHALL, ILL.—The Alton, Jacksonville & Peoria Railway Company is planning to build a new power house on Piasa Creek, about 9 miles beyond Alton.

CONNERSVILLE, IND.—It is reported that plans are being prepared by E. D. Johnson, president of the local hydraulic company, for the construction of a dam across the Whitewater River and to erect and equip two power plants, one to be located on the canal at the

old water works and the other at the south end of the city, near a mill.

LINTON, IND.—An election will soon be called to submit the proposition to the voters as to whether bonds shall be issued for enlarging the municipal electric-light plant, or whether to sell the municipal plant to a private corporation.

MOORESVILLE, IND.—The plant of the Mooresville Electric Light & Power Company was wrecked by an explosion July 5, caused by the bursting of a fly-wheel.

NOBLESVILLE, IND.—Henry Sheridan, referee in bankruptcy in this district, has appointed the Wainwright Trust Company, of Noblesville, receiver for the White River Light & Power Company. An application will soon be made to sell the plant. A petition has been filed asking that the hydraulic dam and other property belonging to the company be turned over to the bondholders, which was withdrawn with the understanding that the Wainwright Trust Company be made receiver. The White River Light & Power Company owns a dam located about two miles north of Noblesville, work on which was begun about three years ago and has never been finished owing to lack of funds. It is understood that a new company stands ready to take over the property and operate the plant.

WARREN, IND.—A day service has been established in connection with the municipal electric-light system in Warren. The Town Board has made arrangements with the Marion, Bluffton & Eastern Traction Company to supply electrical energy for the service. Preparations have been made to supply electricity for factories and industrial plants. The Town Board would like to communicate with parties contemplating the establishment of new plants or making a change in location of their plants with a view of offering them inducements to locate in Warren. We are informed that there are several buildings suitable for factory purposes and that power can be secured at reasonable rates. William E. Stewart is president of the board, and W. H. Hickerson is superintendent of the municipal electric plant and water-works system.

BOONE, IA.—Contracts have been awarded by the Boone Electric Company to the Allis-Chalmers Company, of Milwaukee, Wis., for two 1000-kw turbines, and to the Edge Moor Iron Company, of Edge Moor, Del., for three 400-hp boilers. The company has recently closed negotiations with the Chicago & Northwestern Railway Company by which it will supply electricity to operate the large new car shops of the railroad company.

CENTER POINT, IA.—Another special election will have to be called by the town of Center Point before it can issue bonds for the installation of an electric-light system.

COUNCIL BLUFFS, IA.—The City Council has accepted the proposition submitted by F. A. Nash, president of the Citizens' Gas & Electric Company, to install a new lighting system in the business district of the city, provided the Council gives the company a five-year contract for street lighting at the expiration of the present contract, which expires Oct. 1, 1911. Under the terms of the contract the company is to install not less than forty flaming-arc lamps, of which part are to be erected on ornamental lamp standards and part to be overhead construction in the center of the street. The price is to be $95 per lamp per year, with a guarantee that the net price (deducting royalty) paid by the city shall not exceed $75 per lamp per year. The company also agrees in consideration of the renewal of the contract for five years to charge consumers for electricity on the regular Omaha schedule of 14 cents and 6 cents per kw-hour and to supply gas at the rate of $1.15 per 1000 cu. ft. The company is to continue to the city of Council Bluffs the same royalties on gas and electricity as are now being paid, and also to provide ornamental iron posts for the installation of flaming-arc lamps.

DAVENPORT, IA.—The Davenport-Muscatine Railway Company has begun work on the construction of its proposed railway between Davenport and Muscatine, 30 miles in length. Electricity for operating the railway will be secured from the Tri-City Railway & Light Company. The company will supply electricity for lighting purposes. J. F. Porter, of Davenport, Ia., is president of the Davenport-Muscatine Company.

SILVER CITY, IA.—The installation of an electric-lighting system in Silver City is under consideration.

SIOUX CITY, IA.—The question of securing power from the Niobrara River in Nebraska for Sioux City is under consideration by the Sioux City Service Company. R. J. Dunham, of Chicago, Ill., is president of the company.

VAN HORNE, IA.—A petition has been presented to the City Council asking for a special election to be called to vote on the question of establishing a municipal electric-light and power plant in Van Horne. The plant of the Van Horne Electric Light & Power Company was destroyed by fire on June 29. It is not expected that the plant will be rebuilt. The town at present is without electrical service.

CANTON, KAN.—Plans are being considered for the installation of a municipal electric-light plant and water-works system, to cost about $30,000. T. Newton Frantz is city clerk.

LEAVENWORTH, KAN.—Plans are being prepared by D. A. McKibben, of Leavenworth, Kan., and W. B. Walker, of Excelsior Springs, Mo., to organize a company to build an electric railway from Leavenworth to Excelsior Springs, Mo. The proposed railway will be 40 miles in length and will pass through Beverly, Platte City and Liberty, Mo. The power plant will be located in Leavenworth and will also supply electricity for lamps and motors. The company is to be known as the Leavenworth & Excelsior Springs Railway & Power Company and will be capitalized at $2,000,000.

MOLINE, KAN.—The citizens have voted against the proposition to grant an electric-light franchise. The Moline Stone, Lime & Cement Company, it is said, will submit a proposition to light the town.

TOPEKA, KAN.—Plans are being considered for rebuilding the State power plant, bids for which will be called for in the near future.

BOYCE, LA.—The Town Council has awarded the contract for the installation of a municipal electric-light plant in Boyce.

VIVIAN, LA.—The Vivian Ice, Light & Water Company, recently organized with a capital stock of $50,000, is reported to be contemplating the installation of an electric-light plant, ice plant, water-works and sewerage systems. O. C. Jacobs, of Oklahoma City, Okla., is president, and J. D. Wilkinson, of Shreveport, La., secretary.

BIDDEFORD, MAINE.—The building used by the Atlantic Shore Railway Company for its storage-battery building in Biddeford, Me., was destroyed by fire recently, causing a loss of about $10,000.

GREENVILLE, MAINE.—The Greenville Light & Power Company is erecting a dam 70 ft. long and 30 ft. high in Elliottsville and will build a hydroelectric plant to supply electricity to the slate quarries and other industries in Monson.

WATERVILLE, MAINE.—The Waterville & Fairfield Railway & Light Company is in the market for a second-hand 500-kw turbine for its power house in Waterville.

WEST SCARBORO, MAINE.—The Consolidated Electric Light & Power Company, of Portland, Maine, is extending its transmission line from Windham to Dunstan Corner. The company will supply electricity for lighting the village of West Scarboro and also to the Portland Railroad Company.

BALTIMORE, MD.—The installation of a municipal heating, lighting and power plant is reported to be under consideration. The proposed plant would be installed in conjunction with the pumping station and would furnish heat and electricity for the City Hall and annexes and court house.

CUMBERLAND, MD.—The Mayor and Council have passed an order approving the proposed consolidation of the Chesapeake & Potomac Telephone Company and the Western Maryland Telephone Company. Under the terms of the consolidation the stockholders of the Western Maryland Company will receive $80,000 for their stock and the Chesapeake & Potomac Telephone Company will assume the bonded indebtedness of $165,000.

HAGERSTOWN, MD.—Plans have been completed by P. O. Keilholtz, electrical engineer, for the proposed power plant to be erected by the Western Maryland Power Company at Security, which will supply electrical energy for the Frederick Railroad Company, of Frederick, Md., and the Hagerstown Railway Company, of Hagerstown, Md. The proposed plant will cost about $200,000 and will have an output of about 2800 kw.

TAKOMA PARK, MD.—The Town Council has authorized Mayor W. G. Platt to enter into a contract with the Potomac Electric Power Company to install an electric lighting system in Takoma Park, consisting of 100 incandescent lamps of 32 cp. At present the town is lighted by oil lamps.

FALMOUTH, MASS.—The Buzzards Bay Electric Company has applied to the Board of Gas and Electric Light Commissioners for authority to extend its transmission lines into the towns of Barnstable, Bourne and Sandwich for the purpose of supplying electricity for lamps and motors.

FALL RIVER, MASS.—A contract has been placed with the General Electric Company for the installation of an electric plant for the Pilgrim Mills.

FOXBORO, MASS.—The Southeastern Electric Company has submitted a proposition to purchase the plant of the Foxboro Electric Company and also plants in several towns in this vicinity. The Southeastern Electric Company, it is said, if successful in securing the plants, will install a large central power plant, probably in Foxboro.

GRANITEVILLE, MASS.—The Lowell Electric Light Corporation has applied to the Board of Selectmen for locations for poles for its transmission lines in the villages of Brookside, Westford Centre, Forge Village and Graniteville. It is expected to have the street-lighting system installed by Sept. 1.

READING, MASS.—The Board of Electric Light Commissioners is preparing plans for extending the local electric light service to Wilmington.

DEERWOOD, MICH.—We are informed that the Cuyuna Range Light & Power Company does not propose to do work of any importance on its proposed hydroelectric plant, to be erected at or near the Crow Wing River, until next year.

GRAND HAVEN, MICH.—Owing to the municipal electric light and power plant being unable to meet the demands made upon it the City Council has asked the Grand Rapids-Muskegon Power Company, of Muskegon, Mich., to submit a proposition to take over the municipal plant and furnish electricity for lighting the streets and municipal buildings and for commercial and residential lighting. In order to equip the municipal plant for the additional service it will require an

expenditure of quite a sum of money, and it is thought that the power company can furnish electricity at less cost than the city can generate it.

HOUGHTON, MICH.—A proposition to install a new street-lighting system on Shelden Street has been submitted by Gardner Rogers, general manager of the Houghton County Electric Light Company, to cost about $2,000 per year. At present strings of incandescent lamps are used, which are paid for by subscriptions from the business men. Under the new plan it is proposed to erect flaming arc lamps. The village pays $750 for the arc lamps now in use, which would be included in the scheme, and business men would be asked to pay for the remainder.

IRON MOUNTAIN, MICH.—The Peninsula Power Company has awarded contracts to the Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., for machinery for the initial installation at its plant at Twin Falls on the Menominee River, including two turbine wheel generators and other accessories. The flume to be constructed will provide for five wheels. The contract for construction of dams, flumes, etc., has been awarded to the Newton Construction Company, of Milwaukee, Wis.

ISHPEMING, MICH.—The Marquette County Gas & Electric Company is contemplating the purchase of a 200-kw converter.

SEBEWAING, MICH.—Plans are being made for the construction of a municipal electric-light plant in Sebewaing, bids for which will be received until Aug. 7. J. Hummelein is city clerk.

LITTLE FALLS, MINN.—The American Engineering & Construction Company, of Cleveland, Ohio, has applied for a franchise to install an electric-light and power plant and street-railway system in Little Falls.

ST. PAUL, MINN.—Contracts have been awarded by the St. Paul Railway Promotion Company to the Hoy, Elzy Company for the construction of its proposed electric railway between Inver Grove and Hastings, work on which will begin in the near future. Cars will enter the city from Inver Grove on the tracks of the Twin City Rapid Transit Company. It is said that negotiations are under way for extending the railway to St. Paul Park, Newport and possibly Langdon. The railway will eventually be extended from Hastings to Red Wing, Frontenac, Lake City, Mankato and Faribault.

HICKORY, MISS.—The installation of a municipal electric-light plant in Hickory is reported to be under consideration.

NEWBURG, MO.—The Board of Aldermen has granted W. N. Schwabe and E. Spaulding, of Newburg, a franchise to construct and operate an electric-light plant in this city for a term of twenty years.

QUEEN CITY, MO.—The contract for furnishing equipment for the municipal electric-light plant has been awarded to the Fairbanks-Morse Company of St. Louis, Mo., for $4,080.

RICH HILL, MO.—The Atlas Coal Company is reported to have awarded contract for construction of its proposed electric-light and power plant to F. D. Martin, of Ft. Scott, Kan. The contract includes electrical work and the erection of about 3000 ft. of pole line. Contract for engine has been awarded.

ST. JOSEPH, MO.—The proposition to enlarge the municipal electric-light plant is reported to be under consideration.

HELENA, MONT.—The State Board of Examiners has awarded the contract for furnishing and installing fixtures in the State Capitol Building at Helena to the Morean Company, of Cleveland, Ohio, for $10,000.

MINDEN, NEB.—At an election held July 11 the citizens voted in favor of the proposition to issue bonds to the amount of $15,000, the proceeds to be used for the installation of a municipal electric-light plant. The Minden-Edison Light & Power Company, which furnishes electrical service in Minden, has filed an injunction suit enjoining the issuance of the bonds. Owing to excessive rates charged by the company for its service the city has decided to install and operate a municipal plant. The maximum price charged by the company for electricity is 22 cents per kw-hour. The city also tried to secure a reduction in the price of street lamps and to extend the street-lighting system, but was not satisfied with the proposition submitted by the company.

RENO, NEV.—Plans are being perfected by the Reno Power, Light & Water Company for extensive improvements to its system.

BERNARDSVILLE, N. J.—The Pennsylvania Electric & Power Company is reported to have purchased the plant and holdings of the Bernardsville Water Company. The latter company supplies electrical service in Millington, Mendham, Lyons, Peapack, Gladstone and other outlying districts.

NEWARK, N. J.—The W. V. Snyder Company has decided to install an electric-light and power plant to supply electricity for lighting its store, operating elevators, cash systems, etc., and also to heat the building. The contract for equipment has been awarded to George W. Fowler & Company, engineers, of New York, N. Y.

PATERSON, N. J.—Bids will be received by William H. Mason, chairman of road committee, Court House, Paterson, N. J., until Aug. 2 for lighting the public boulevards and roads, and places controlled by the Board of Chosen Freeholders of Passaic County, as follows: (1) About 200 arc lamps of 1200 cp, for contract for one, three, five and ten years. (2) About 200 arc lamps of 2000 cp, for contract for one, three, five and ten years. For 32-cp incandescent lamps about 400, to light the places now lighted by arc lamps, for contract for one, three, five and ten years. Plans and specifications are on file at the office of the clerk of board.

WEST ORANGE, N. J.—The Town Council has entered into a contract with the Public Service Electric Company for street lighting for a term of five years, under which the company is to furnish arc lamps at $80 each per year.

DEMING, N. M.—Plans are being made for improvements and extensions to the plant of the Deming Ice & Electric Company, which will involve an expenditure of about $100,000. The company is planning to supply electricity to a 4000-acre tract, which is to be colonized, about 3½ miles east of Deming. It is proposed to install motors on each 100 of the 4000 acres to operate pumps for irrigating purposes.

RED ROCK, N. M.—Preliminary surveys are being made with the view of locating a site for a large hydroelectric plant on the Gila River near Red Rock. Transmission lines will be erected from the power station to the Mogollon mining district to supply electricity to operate the mills and mines, and also to Silver City and a number of towns and industrial centers within a radius of 100 miles of Red Rock. Col. J. W. Carter, of Silver City, N. M., and associates are interested in the project.

ALBANY, N. Y.—The State Trustees of Public Buildings have awarded the contract for steam equipment for the Capitol power house and the steam and return connections between the power house, Capitol and State Education Building to Gillis & Geohegan, of New York, N. Y., for $202,083, and to the Lord Electric Company, of New York, N. Y., the contract for electric equipment between the buildings for $95,200.

BROOKLYN, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, corner Park Avenue and Fifty-ninth Street, New York, N. Y., until July 31 for installing electric equipment in new Public School 168, located on Throop Avenue, between Bartlett and Whipple Streets, Brooklyn, N. Y. Blank forms, plans and specifications may be seen at the above office, and also at branch office, 131 Livingston Street, Brooklyn, N. Y.

BUFFALO, N. Y.—Arrangements have been made whereby the Niagara, Lockport & Ontario Power Company will secure control of the Oswego County Light & Power Company, in which William P. Gannon and Charles A. Lux, of Syracuse, are interested. The Oswego County Light and Power Company has a power development on the Salmon River of from 15,000 to 20,000 hp.

BUFFALO, N. Y.—Negotiations have been closed by the Federal Telephone & Telegraph Company, of which the Frontier Telephone system is an integral part, for the purchase of the property of the Independent Union Telephone Company, of New York and Pennsylvania. The property includes about 300 miles of long-distance cables and twenty exchanges. The property is valued at about $1,000,000. The Federal Company recently purchased the property of the Rochester Telephone Company.

CATSKILL, N. Y.—Application has been made to the Public Service Commission, Second District, for approval of the consolidation of the Upper Hudson Electric & Railroad Company, the Schoharie Light & Power Company, of Schoharie, N. Y., and the Catskill Illuminating & Power Company, of Catskill, N. Y., under the name of the Upper Hudson Electric & Railroad Company. The new company is to be capitalized at $500,000 and proposes to execute a mortgage to secure a bond issue of $1,000,000. The company asks for authority to issue $420,000 in bonds at once.

CENTRAL ISLIP, N. Y.—The contract for engine, dynamo, etc., for the North Colony power house, bids for which were opened May 10, has been awarded to the Commercial Construction Company, of New York, N. Y., for $6,463. K. McGarr is secretary.

FT. COVINGTON, N. Y.—The Public Service Commission, Second District, has authorized the Fort Covington Light, Heat & Power Company to mortgage its property to secure an issue of bonds to the amount of $7,000. The company has been granted permission to issue presently $5,000 in bonds to discharge existing obligations and a hearing is ordered upon the request to issue $2,000 in bonds, the proceeds to be used for the construction of a concrete dam.

HALFMOON, N. Y.—Plans are being made for the construction of an electric railway from Rexford Flats to either Waterford or Cohoes. The new line will be known as the Crescent-Halfmoon Railway. The officers are: John Richmond, president; C. B. Hawley, vice-president; C. B. Hawley, secretary, and A. C. Newton, treasurer.

NEW YORK, N. Y.—Bids will be received by C. B. J. Snyder, superintendent school buildings, Department of Education, corner Park Avenue and Fifty-ninth Street, New York, N. Y., until July 31 for installing electric equipment in Washington Irving High School, located at Irving Place, Sixteenth and Seventeenth Streets, New York, N. Y. Blank forms, plans and specifications may be obtained at the above office.

NEW YORK, N. Y.—It is reported that orders have been placed by the Dry Dock, East Broadway & Battery Railroad Company, of New York, N. Y., with the Electric Storage Battery Company, of Philadelphia, Pa., for equipping thirty-five new cars with storage batteries. The work will begin in August and will continue at the rate of seven a week.

NEW YORK, N. Y.—Bids will be received by the Department of Public Charities, foot of East Twenty-sixth Street, New York, N. Y., until July 28, for furnishing and installing two new boilers and accessories in the power house of the Metropolitan Hospital District, Blackwell's Island, Borough of Manhattan. Blanks and further information may be obtained at the office of the supervising engineer of the de-

partment, foot of East Twenty-sixth Street, New York, where plans and specifications may be seen. Michael Drummond is commissioner.

NEW YORK, N. Y.—The Long Acre Electric Light & Power Company has applied to the Public Service Commission for permission to issue bonds ultimately to the amount of $50,000,000. It is not proposed to apply for authority at present to issue more than $10,000,000. At present it is understood that the company desires only $6,000,000. Charles N. Jackson, superintendent, states that a plant with sufficient output to begin with could be built within a year at a cost of about $5,275,000, including all expenses. It is proposed to install a plant with an initial output of 15,000 kw and an ultimate output of 25,000 hp.

NEW YORK, N. Y.—Contracts have been awarded by C. B. J. Snyder, superintendent of school buildings, Department of Education, New York, N. Y., as follows: For repairs, alterations and additions to the electric equipment in Public School 160, Manhattan, to the Anderson-Martin Electric Company, for $1,639; for installing electric equipment in new Public School 46, the Bronx, to T. Frederick Jackson, Inc., at $10,762; for installing electric-light equipment in Truant School, Brooklyn, to Reis & O'Donovan, Inc., at $3,940, and Public School 73, Brooklyn, to the New York Construction Company, for $6,120, and for repairs, alterations and additions to the electric equipment in Public School 37, Brooklyn, to the J. F. Electric Company, for $1,068.

NORTH TONAWANDA, N. Y.—A contract has been awarded by the J. Spaulding & Sons Company, of Rochester, N. H., to the Aberthaw Construction Company, of Boston, Mass., for the construction of a large fiber mill, to be located in North Tonawanda, N. Y. One building will be 265 ft. x 300 ft., one story high, the other building 265 ft. x 60 ft., two stories high, with small connecting building for machine shop and power station.

PERRY, N. Y.—The plant and holdings of the Perry Electric Light Company are reported to have been sold to Edwin D. Hamlin and Ellis L. Phillips, both of New York.

SOUTHAMPTON, N. Y.—The Village Trustees have awarded a contract to the Suffolk Lighting & Heating Company, of Southampton, for lighting the streets of the village for a period of three years. Under the terms of the contract the company is to furnish 156 incandescent lamps of 32 cp and five 1200-cp arc lamps at $3,437 per year.

SYRACUSE, N. Y.—Work will begin immediately on the erection of a new transformer station for the Syracuse Rapid Transit Company. The new substation will be located on Townsend Street and will supply electricity for operating the Butternut, Oak, East Syracuse, Hawley and east end of East Genesee street-railway lines. The station will ultimately be equipped with two 1000-kw rotary generators, one of which will be installed at once. The cost of the station is estimated at about $73,000.

UTICA, N. Y.—In a decision handed down by Judge Ray, of the United States District Court, the property of the Hudson River Electric Power Company and its subsidiary companies has been ordered to be consolidated and sold, with the exception of the Saratoga Springs Gas & Electric Company and the Madison County Gas & Electric Company, which are to be sold separately.

WEST HEBRON, N. Y.—It is reported that Peter Busseno is planning to install an electric-light plant at the People's Exchange.

LOWELL, N. C.—Contracts have been placed by the Spencer Mountain Mills for the reconstruction of its power plant, which was recently destroyed by fire. The cost of the work is estimated at about $20,000. The company also supplies electrical service in Gastonia, N. C.

MANDAN, N. D.—The contract for the construction of the power station of the municipal electric-light plant has been awarded to G. W. Haggert, of Fargo, N. D. The cost of the plant is estimated at about $75,000.

CINCINNATI, OHIO.—A new schedule of rates for electricity was put into effect the first of the month by the Union Gas & Electric Company, by which, it is claimed, a saving of from 7½ per cent to 12 per cent over the present rates will be made. The present rate is 10 cents per kw-hour as a basis, with the 10-cent rate applicable for first thirty hours; for the second thirty hours the rate is 6 cents, and for all energy consumed over this amount there is a fixed schedule of discounts on bills ranging from 5 per cent to 50 per cent. Under the new schedule the maximum rate is 10 cents per kw-hour and the minimum rate 1½ cents per kw-hour, according to the amount consumed.

COLUMBUS, OHIO.—W. C. Kennedy, custodian of the Federal Building, has awarded the contract for supplying electricity for lighting the government building, located at State and Third Streets, to the Columbus Railway & Light Company. The installation of an electric-light plant in the government building has been abandoned.

COLUMBUS, OHIO.—Bids will be received by the Director of Public Service, Columbus, Ohio, until Aug. 1, for furnishing and installing four 75-lamp rectifier equipments for magnetic lamps, 320 magnetite arc lamps, and two synchronous condensers, plans and specifications for which are on file at the office of the Director of Public Service, Department of Lighting, from whom copies may be obtained. H. S. Holton is Director of Public Service.

MOUNT VERNON, OHIO.—Sealed proposals will be received by the Ohio State Sanatorium Commission at the office of Dr. C. O. Probst, secretary, State House, Columbus, Ohio, until Aug. 12 for furnishing materials and installing complete the feed wires and yard lamps at the Ohio State Sanatorium, located near Mount Vernon, Ohio, for which plans and specifications are on file at the office of the secretary of the Ohio State Sanatorium Commission, and at the office of Frank L. Packard, architect, Columbus, Ohio.

NAPOLEON, OHIO.—The plant and holdings of the Napoleon Home Telephone Company have been sold to W. L. Parmenter, of Lima, Ohio, for $21,000 by R. P. Brown, receiver, subject to the approval of the court.

SHARPSBURG, OHIO.—The Black Diamond Coal & Coke Company has awarded the contract for the construction of power house and coal tipples at Lathrop, Ohio, to E. Elford, of Columbus, Ohio.

TOLEDO, OHIO.—Preliminary plans have been made for the new power building and nearly $25,000 has been raised toward the project. The company will be known as the Toledo Factories Company and will be capitalized at $300,000. It is understood that the company will issue $200,000 in bonds, of which one-half will be issued immediately. The cost of the building complete is estimated at about $360,000.

BARTLESVILLE, OKLA.—The plant and holdings of the Bartlesville Light & Water Company have been sold to Ira L. Kobe, representing bondholders, for $90,000. It is understood that improvements will be made to the plant.

BUTLER, OKLA.—The Town Trustees, it is said, have granted W. K. Kise a twenty-year franchise to construct and operate an electric-light plant in Butler.

CUSTER CITY, OKLA.—Preparations are being made for the construction of an electric-light plant and water-works system in Custer City, bids for which have been asked. The Western Engineering Company, consulting engineers, of Oklahoma City, Okla., has charge of the engineering work.

OKLAHOMA CITY, OKLA.—Arrangements are being made by the Oklahoma Gas & Electric Company for the construction of a substation in the industrial addition south of the Morris packing plant.

CENTRAL POINT ORE.—The Rogue River Electric Company, of Medford, Ore., which supplies electrical service in Central Point, has announced that for the purpose of encouraging factories and industrial plants to locate in Central Point, the company will supply electricity free of charge for one year, providing the new factories started do not compete with industries already established. Dr. C. R. Ray, of Medford, is president of the company.

EUGENE, ORE.—Beginning July 1 electricity for operating the city pumping station has been supplied from the municipal hydroelectric plant at Waterville, 14 miles distant. The plant consists of two units of 2600 hp each, delivering current at 2300 volts, which is stepped up to 22,000 volts for transmission to Eugene. Only a small part of the power generated at the plant is required for pumping the city water, and plans are under way for the installation of a municipal street-lighting system. The proposition to issue bonds to provide funds for same will soon be submitted to a vote. The Oregon Power Company now supplies electrical service in Eugene.

HOOD RIVER, ORE.—The local power plant of the Hood River Light & Power Company will soon be closed down and electrical energy for the local system will be transmitted from the company's power house on the White Salmon River. Transmission lines are now being erected from The Dalles to Hood River. The local power station will be held in reserve for use in emergencies.

KLAMATH FALLS, ORE.—The Klamath Falls Light & Power Company has announced a reduction in the price of electricity of 30 per cent. The meter rate has been reduced from 15 cents to 10 cents per kw-hour, and the flat rate has been reduced accordingly.

KLAMATH FALLS, ORE.—The Rogue River Electric Company, of Medford, Ore., has applied to the City Council for a franchise to supply electricity in Klamath Falls. In the proposition submitted to the Council the company agrees to supply electricity at a lower rate than is now given the city, and in addition would pay the city 5 per cent of the gross profits of the company.

METOLIUS, ORE.—Preparations are being made for the installation of an electric-light system in Metolius this summer. It is proposed to generate electricity in connection with the pumping plant of the town well. It is proposed to secure electrical service later from the power plant now being erected on the Crooked River by Pineville capitalists. Metolius has not a post office.

PANAMA.—Proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until Aug. 4, for furnishing one 500-kva, 25-cycle, three-phase, 2200-volt turbo-generator unit, road roller, hose and creosoted cross ties. Blanks and general information relating to this circular may be obtained from the above office or at the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. Captain F. C. Boggs is general purchasing officier.

ASPINWALL, PA.—The contract for generator, switchboard, etc., for the municipal electric-light plant has been awarded to the Westinghouse Electric & Manufacturing Company, of East Pittsburgh, Pa.

CHAMBERSBURG, PA.—The question of making improvements and installing new machinery at the municipal electric-light plant is under consideration.

EAST STROUDSBURG, PA.—The Eastern Pennsylvania Power Company, of Easton, Pa., has applied to the Borough Council for a new franchise in this borough.

ETNA, PA.—Bids will be received at the office of the Borough Council until July 24 for construction of power house and furnishing equipment and machinery, complete, for a new electric-light plant for the borough. Plans and specifications may be obtained at the above office. J. C. Armstrong is clerk.

LEBANON, PA.—Application will soon be made for a charter for the Lebanon & Campbelltown Street Railway Company to construct and operate an electric railway between Campbelltown and Lebanon. The incorporators are: M. S. Hershey, J. B. Leithiser, John B. Snyder, S. C. Stecher and F. B. Snavely.

LOCUST GAP, PA.—The new electric plant at the Locust Gap Colliery has been completed. The plant will also supply electricity for lamps and motors at the Potts Colliery, at Locust Dale.

POTTSTOWN, PA.—The City Council is considering the question of submitting the proposition to issue $75,000 in bonds for a municipal electric-light plant to a vote of the people.

SWARTHMORE, PA.—The contract for construction of a power plant, 61 ft. x 176 ft., for Swarthmore College, to cost about $75,000, has been awarded William Provost.

WAYNESBURG, PA.—The Beaver Valley Electric Light Company has taken over the plant and holdings of the Waynesburg Electric Light & Power Company under lease. It is understood that the new company will make improvements to the plant, including the installation of a Westinghouse generator and a gas engine.

YORK, PA.—Plans are being prepared by the Pennsylvania Railroad Company for equipping the Frederick branch between Columbia and Frederick, a distance of 50 miles, for electrical operation.

MANILA, P. I.—Plans are being made by O. M. Shuman, of Manila, for extensions to the electric-light plant which he has leased from the government. Mr. Shuman is in the market for electrical equipment for power house and for lighting and power circuits, and would like to receive price lists and catalogs from manufacturers.

PROVIDENCE, R. I.—The Narragansett Electric Lighting Company has erected various styles of lamps on Arch Street and Parkis Avenue for the purpose of demonstrating the efficiency of incandescent lamps as compared with arc lamps on streets which are heavily shaded by trees. The company will burn the tungsten lamps on Parkis Avenue for a month so that the city may have an opportunity to decide which is more suitable.

GREENVILLE, S. C.—The Southern Power Company, of Charlotte, N. C., has secured contracts to supply electricity to operate the new Duncan and Westervelt mills in Greenville, now under construction. Each mill is to be equipped with 50,000 spindles with full accompaniment of looms and other machinery, each using about 1500 hp. The new Dunean mill will be equipped for individual motor drive and will require more than 200 small motors.

HONEA PATH, S. C.—The Board of Public Works is reported to have engaged Thomas W. Cothran, of Greenwood, S. C., to prepare plans and take charge of the construction of the proposed municipal electric-light plant, for which bonds to the amount of $11,000 were recently voted.

NEWBERRY, S. C.—The Southern Power Company has recently closed a contract with the Oakland Cotton Mills to supply electricity to operate its mills when completed. The plant will be equipped with 20,000 spindles.

WHITMORE, S. C.—The Glenn Lowery Cotton Mills Company, of Whitmore, has decided to abandon its steam plant and operate its mills by electricity, and has closed a contract with the Southern Power Company, of Charlotte, N. C., to supply energy to the amount of 1500 hp.

SOUTH PITTSBURG, TENN.—The plant of the South Pittsburg Electric Light & Power Company was destroyed by fire July 13. The plant was located in the old pipe works and foundry building, owned by the United States Cast Iron Pipe & Foundry Company, of Chattanooga, Tenn. The total loss is estimated at about $14,000, of which the loss to the electric company is placed at about $8,000. The electric plant, it is said, will be rebuilt at once.

DALLAS, TEX.—Preliminary plans are being prepared by the East Texas Traction Company for the construction of an interurban electric railway between Dallas and Terrell, Tex. Schuyler B. Marshall, of Mesquite, Tex., is president of the company.

DEL RIO, TEX.—Announcement has been made by D. B. Chapin, who is promoting the construction of a large dam across Devil's River and the establishment of a large irrigation system for reclaiming more than 100,000 acres of arid lands in the vicinity of Del Rio, that arrangements have been made for financing the project, provided certain stipulations are complied with in the matter of securing the necessary lands. Mr. Chapin has secured options on 90,000 acres and contracts will be closed for 30,000 acres more. The plans embrace the installation of a large hydroelectric plant and the erection of transmission lines to a number of towns in west Texas. A number of industrial plants, among them a cotton mill, are proposed in connection with the project.

FORT WORTH, TEX.—The holdings of the Citizens' Railway & Light Company, of Fort Worth, Tex., which were sold at a receiver's sale on July 2, were purchased by different interests, the total consideration for the various properties being $660,000. The Arlington Heights & Rosen Heights street railway lines, embracing about twelve miles of tracks with equipment and bonus, were acquired by the Northern Texas Traction Company for $400,000. The J. R. Nutt Light & Power Company, of Cleveland, Ohio, purchased the electric power plant and franchises for $250,000. Lake Como Park, a pleasure resort, was sold to A. J. Duncan for $10,000. The Northern Texas Traction Company, it is said, will improve the two railway lines and merge them into its present system.

HILLSBORO, TEX.—The citizens of Hillsboro and adjacent territory have accepted the proposition submitted by the Southern Traction Company to construct an electric interurban railway, to extend from Dallas to Waco, through Hillsboro. The proposition provides that preferred stock of the company to the amount of $75,000 shall be subscribed and the right of way from a point in the northwest portion of Hill County through the county to a point south of Abbott, including a franchise through Hillsboro, be donated. J. F. Strickland, of Dallas, is president of the company.

HOUSTON, TEX.—The City Council has granted the Houston Electric Company and the Galveston-Houston Interurban Electric Railway Company a franchise to construct and operate its proposed railways on the streets of the city. The franchise also gives the companies the right to enter into supplemental contracts with each other for joint use of tracks in Houston. Both companies are owned and operated by the Stone-Webster syndicate, of Boston, Mass.

HOUSTON, TEX.—The General Electric Company has received an order from the Houston Lighting & Power Company, of Houston, Tex., for a 37-panel switchboard. This switchboard will control one 3000-kw, one 2500-kw, one 1500-kw and two 600-kw generators, all 2500-volt, 60-cycle, three-phase machines. The switchboard will consist of six generators, four exciters, four station auxiliary, two alternating-current rotary converters, two direct-current rotary converters, one synchronous motor, one direct-current generator, five direct-current feeders, eight alternating-current feeder panels and four blank panels for future circuits. All alternating-current panels are equipped with new-type form K-12 remote-control oil-break switches. The equipment includes a double set of alternating-current buses equipped with knife disconnecting switches, which also act as selectors between the oil switches and buses.

NEW BRAUNSFELS, TEX.—Bonds to the amount of $67,000 have been voted by the taxpayers of New Braunfels, the proceeds to be used for the construction of a dam across the Guadalupe River and for other improvements. A hydroelectric power plant and water-works pumping station will also be installed at the dam.

SAN BENITO, TEX.—Arrangements are being made by the San Benito & Rio Grande Valley Railroad Company to extend its gasoline motor railway to Brownsville. Rights-of-way have been secured for the railway to Santa Matia. The company already operates forty miles of track. Samuel Robertson is president of the company.

WACO, TEX.—A mortgage has been filed on the property of the Waco Street Railway Company and the Waco Electric Light & Gas Company to secure an issue of bonds to the extent of $75,000. It is understood that improvements and extensions are contemplated to both systems. The construction of an interurban electric railway is said to be under consideration.

PROVO, UTAH.—The Telluride Power Company has filed an amendment to its charter with the Secretary of State, which provides that the company may sell and lease surplus water and water rights.

PROVO, UTAH.—Preliminary surveys have been completed for the proposed Salt Lake-Payson Interurban Railway. Simon Bamberger, of Salt Lake City; James S. McBeth, of Payson; W. L. Hayes, of Pleasant Grove, and others are interested in the project.

DANVILLE, VA.—At an election held July 11 the proposition to issue $150,000 in bonds, the proceeds to be used for the installation of a municipal electric-light plant, was carried.

HARRISONBURG, VA.—Plans are being considered for improvements to the municipal electric plant, the cost of which is estimated at about $4,000.

NEWPORT NEWS, VA.—Mayor Jones has notified the Newport News & Old Point Railway & Electric Company that unless the street-car and electric-light service is improved the City Council will be forced to consider the revocation of the franchise. In March the city appealed to the State Corporation Commission, which ordered the company to put its electric plant in repair by July 29.

RICHMOND, VA.—The contract for motors, switchboards and wiring for the new electric-light plant has been awarded to the Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., for $4,455. All propcsals for pumps were rejected and new bids will be asked.

GOLDENDALE, WASH.—The Northwestern Electric Company has purchased the power sites owned by Samuel Hill in the Klickitat Gorge, above Lyle. The consideration is said to have been about $20,000.

GOLDENDALE, WASH.—Announcement has been made that bids have been advertised for by the Northwestern Electric Company for the construction of a large dam to be erected at the power site on the Big Klickitat River, to cost about $100,000. The company proposes to build a large hydroelectric power plant at that place at a cost of about $500,000. Electricity generated at the plant will be used for municipal purposes and for railroad development.

CHARLESTON, W. VA.—The plant of the Charleston Light &

Power Company has been purchased by the Citizens Electric Company, recently incorporated with a capital stock of $50,000. Thomas C. Bowling, who recently purchased the property at trustee's sale, is interested in the company.

HUNTINGTON, W. VA.—The Ohio Valley Electric Railway, it is reported, is planning to increase the output of its power plant by about 60 per cent. New machinery will be installed, including two 2000-hp boilers and two 1000-kw turbines. It is also proposed to erect a substation.

McMECHEN, W. VA.—The City Council has awarded the contract for street lighting to the Ohio Valley Electric Company, of Benwood, W. Va.

FOND DU LAC, WIS.—The City Council has voted to install ornamental street lamps on Main Street in Fond du Lac.

MILWAUKEE, WIS.—It is reported that negotiations are under way by the Milwaukee Electric Railway & Light Company for the purchase of the Plankinton Block power plant.

NORTH FREEDOM, WIS.—The plant and holdings of the North Freedom Electric Light Company have been purchased by O. J. Nelson, of North Freedom, and A. H. Voeck.

LARAMIE, WYO.—The Goldsborough Engineering Company, recently incorporated with a capital stock of $1,500,000, has contracts for extensive irrigation work near Laramie, Wyo.

WINNIPEG, MAN., CAN.—It is reported that water will be turned on at the municipal hydroelectric generating station at Point du Bois for the first time Aug. 15, and the plant will be ready to supply electricity in Winnipeg by Sept. 15. At first two units of 4000 hp will be put into operation. It is expected that the plant will be able to supply 20,000 hp by Dec. 1. Work is progressing rapidly on the erection of the local distributing system.

HAMILTON, ONT., CAN.—The Board of Control has recommended that the Council submit a by-law to the ratepayers to authorize an appropriation of $505,160, for the construction of a plant for the distribution of electricity to be supplied by the Hydro-Electric Power Commission.

MIMICO, ONT., CAN.—The Hydro-Electric Power Commission has submitted a proposition to the Mimico Council offering to install a local plant capable of supplying electricity for fifty street lamps and forty private houses for $7,000, which can be paid for in thirty annual instalments. From 20 hp to 25 hp would be required, which would be supplied from the substation at Cooksville.

ORILLIA, ONT., CAN.—A smelter for treating ores from the Cobalt mines has been erected by a company organized by Rhode Island capitalists under the laws of Canada. The plant covers nearly ten acres and will be operated by electricity, which will be supplied by the Orillia municipal electric plant.

PORT ARTHUR, ONT., CAN.—Among the by-laws passed recently by the ratepayers is an appropriation of $14,000 for extension of the electric-lighting system and $37,000 for changes to the street railway track.

TORONTO, ONT., CAN.—The directors of the Toronto Railway Company have decided to ask the stockholders to authorize an increase of capital stock of from $8,000,000 to $12,000,000, of which $1,000,000 will be given to shareholders as a stock bonus, $2,000,000 will be issued at par to stockholders, in proportion of one new share for every four shares held, and the remaining $1,000,000 will be held in the treasury.

TORONTO, ONT., CAN.—The Civic Hydroelectric Commissioner has issued a schedule of rates for the installation of underground services for lighting the streets in residential districts where the ratepayers object to overhead wires and cement poles. The charge for underground construction is $2.50 per foot frontage on each side of the street. Lamps will be erected on single lamp standards placed 100 ft. apart. No installation of less than one block will be made.

WIARTON, ONT., CAN.—The Council of Wiarton has asked the Hydroelectric Power Commission to submit prices for supplying electrical energy to the amount of 1600 hp to the town.

YARMOUTH CENTRE, ONT., CAN.—The village of Yarmouth Centre is contemplating the installation of an electric-light system. It is proposed to secure electrical energy from the Hydroelectric Power Commission.

MONTREAL, QUE., CAN.—The City Council is reported to be considering the purchase of the plant and holdings of the Montreal Water & Power Company. The price asked for the property is understood to be $7,433,000.

MONTREAL, QUE., CAN.—The Shawinigan Water & Power Company has secured practically all the right-of-way for its transmission line from the power plant at Shawinigan to Montreal. The company is now erecting 70-ft. steel towers to carry the wires. The Montreal Light, Heat & Power Company has contracted to take all the energy generated by the Shawinigan company. The contract calls for 40,000 hp in addition to the 23,000 hp always furnished by the power company. A second development has been completed at Shawinigan which will be capable of ultimately developing 75,000 hp, which with the 55,000-hp plant in operation, will give a total output of 130,000 hp.

MONTREAL, QUE., CAN.—Announcement has been made by the Canadian Light & Power Company, which controls the Montreal Street Railway, that it will deliver energy in Montreal before the end of the month from its generating plant at St. Timothée, on the Beauharnois Canal. In about two weeks the first unit of 7500 hp will be put into operation and soon after another unit will be put in commission. It is expected to generate over 25,000 hp within one year. Through the purchase of the Central Light, Heat & Power Company, recently noted in our columns, and its control of the Montreal Street Railway, the Canadian Company has a demand for more electrical energy than it will be able to generate for the next year or so.

SHERBROOKE, QUE., CAN.—The stockholders of the Sherbrooke Railway & Power Company have ratified the purchase of the property of the Eastern Township Electric Company, of North Hatley, Que., and the Stanstead Electric Company, of Stanstead. The Eastern Township Electricity Company furnishes electrical service in North Hatley and several adjacent towns, and the Stanstead Electric Company supplies electricity for lamps and motors in Lennoxville, Rock Island, Beebe Plains, Derby Lane, Beebe and Derby Centre, Vt. The Sherbrooke company, it is said, will erect a transmission line from Sherbrooke to Stanstead and will supply electricity to villages along the line.

ZIMAPAM, HIDALGO, MEX.—A concession has been granted to Andrew Mackenzie, of Mexico City, by the State government for the installation of a large hydroelectric plant and the erection of transmission lines to extend to the mines in this district and other industrial centers of the State. The concession gives him the use of water rights of the Moctezuma and Tula Rivers to be developed to generate electricity.

## *New Industrial Companies.*

THE BELOIT LIGHTING & HEATING COMPANY, of Beloit, Wis., has filed articles of incorporation under the laws of the State of Illinois with a capital stock of $30,000, for the purpose of manufacturing and assembling heating and lighting machines.

THE CITY ELECTRIC OMNIBUS COMPANY, of Camden, N. J., has been chartered with a capital stock of $500,000 by F. R. Hansell, J. A. MacPeak and I. C. Clow, of Camden, N. J. The company proposes to manufacture electric passenger buses and vehicles, etc.

THE CONTINENTAL TUNNEL MACHINE COMPANY, of New York, N. Y., has filed articles of incorporation with a capital stock of $100,000 to manufacture machinery, engines, etc. The incorporators are: J. J. McElhinny, A. J. J. McElhinny and R. D. Eggleston, all of New York, N. Y.

THE ERIE CONSTRUCTION COMPANY, of Buffalo, N. Y., has filed articles of incorporation with a capital stock of $100,000. The incorporators are: S. T. Bush, H. E. Nichols and W. L. O'Rourke, of Buffalo, N. Y. The company proposes to do a general contracting business, construct and repair railways, electric wires, etc.

THE GENERAL ENGINEERING COMPANY, of Cleveland, Ohio, has filed articles of incorporation with a capital stock of $10,000 to do a general electrical business and manufacture electrical equipment. The incorporators are: Charles McChapman, Bertram T. Wiltberger and Ernest B. Traffbow.

THE GRAFTON ELECTRIC CONSTRUCTION COMPANY, of Grafton, W. Va., has been organized with a capital stock of $6,000 to manufacture and deal in electrical and mechanical fixtures and supplies of all kinds. The incorporators are: William Ile, George L. Abbott, W. F. Faust, John F. Caveney and William Archdeacon, of Grafton, W. Va.

THE HOLMES MOTOR COMPANY, of Kittery, Maine, has been incorporated with capital stock of $500,000 to manufacture and deal in and repair engines, motor cars, motor boats, flying machines and all vehicles requiring or using motive power. L. B. Swett is president, and G. E. Burnham, treasurer, both of Kittery, Me.

THE ILLUMINATING PRODUCTS COMPANY, of Newark, N. J., has been granted a charter with a capital stock of $25,000. The company proposes to manufacture a new design of flaming-arc lamp, sign lamp transformers, etc. Plans are being made by the company to erect a plant in Newark, N. J. Steinharter & Jost, 320 Broadway, New York, N. Y., it is said, have charge of the company's affairs.

THE MERCHANTS' ELECTRIC AUTO COMPANY, of Indianapolis, Ind., has been incorporated by Harry B. Stout, M. L. Darrow, John E. Speigel, Charles B. Tingle and H. B. Stout, Jr. The company is capitalized at $50,000 and proposes to manufacture automobiles and electrical supplies of all kinds.

THE NEW PROCESS LIGHTING & HEATING COMPANY, of Laporte, Ind., has been granted a charter with a capital stock of $50,000 for the purpose of manufacturing gas machines, gas engines, gasoline engines and other appliances. The incorporators are: Charles F. Peterson, Charles J. Mudleman, Fred W. Steigely, James Kolar and Harry B. Johnston.

THE NEW YORK DIE-WHITE-SCHROEDER COMPANY, of Owego, N. Y., has been incorporated by A. Dewes, C. W. Dewes and F. White, of New York, N. Y. The company is capitalized at $30,000 and proposes to do a general mechanical and electrical engineering business; also to manufacture dies, tools, machinery, etc.

## New Incorporations.

SAN FRANCISCO, CAL.—The Mokelume River Power Company has been incorporated with a capital stock of $3,000,000 by L. Brown, A. H. Elliott, A. M. Sherman, M. E. Logan and S. C. Elliott.

MERIDEN, CONN.—The West Peak Railroad Company has been chartered to build an electric railway from Southington to the summit of West Peak in Meriden. The proposed railway will connect with the Connecticut Company at Southington. C. J. Danaher, of Meriden, is interested in the project.

WILMINGTON, DEL.—The National Water & Power Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $250,000. The incorporators are: H. W. Davis, S. E. Roberson and F. M. Shive, of Wilmington, Del.

TOCCOA, GA.—The Appalachian Power Company has been granted a charter with a capital stock of $250,000 and a fifteen-year franchise by the City Council to erect and operate an electric system in Toccoa. The company is planning to develop about 3200 hp. The incorporators are: Louis B. Magid, of Tallulah Falls, Ga.; William Hurd Hillyer, of Atlanta, Ga., and D. S. Wommack, of Toccoa, Ga.

GIBSON, ILL.—Articles of incorporation have been filed for the Central Electric Light, Heat & Power Company by A. Hood, H. L. Clarke and J. Hood. The company is capitalized at $100,000 and proposes to operate a heat, power and light plant.

ODIN, ILL.—The Odin Telephone Exchange Company has been incorporated by James M. Dace, Charles E. Sloan, Lafayette Somerville and J. M. Dace, of Odin, Ill. The company is capitalized at $15,000.

PRESTONBURG, KY.—Articles of incorporation have been filed for the Prestonburg Electric Light Company by Howard Estell, O. P. Powes and J. H. Spaulding. The company is capitalized at $6,000.

ATLANTIC CITY, N. J.—The Atlantic County Telephone Company has been incorporated with a capital stock of $50,000 by F. A. Demarset, of Philadelphia, Pa.; C. W. Caskell and G. W. Stone, of Atlantic City, N. J. The company proposes to operate telephone lines, etc.

BEACH CITY, OHIO.—The Beach City Electric Light & Power Company has been incorporated by A. H. Elliott, Iva Arnold, W. H. Smith, George D. Viere and A. T. Dennis. The company proposes to supply electricity for lamps and motors in Beach City.

NEW PHILADELPHIA, OHIO.—The County Electric Company, of New Philadelphia, has been incorporated with a capital stock of $700,000 by S. L. Louden, H. K. Cavener, L. H. Purcell, M. R. Thornton and H. Miller. The company proposes to lease and operate natural and artificial gas plants and purchase stocks in other companies.

EBENSBURG, PA.—The Cambria Township Light, Heat & Power Company has been incorporated with a capital stock of $5,000 by Thomas D. Davis and Walter Jones, of Ebensburg, Pa., and T. P. Burns, of Nanty Glo.

WEST LEBANON, PA.—The West Lebanon Electric Light & Power Company has been granted a charter with a capital stock of $5,000 to supply electricity for lamps and motors in West Lebanon. The incorporators are: Daniel Weaver, treasurer; Jacob B. Weaver, Henry Weaver, Raymond S. Bicksler and John S. Weaver.

NEW CUMBERLAND, W. VA.—Articles of incorporation have been filed by the Hancock County Electric Company with a capital stock of $12,000 by N. D. Miller, J. F. Flood, H. E. Armstrong, S. E. McCoy and S. D. Stewart. The company proposes to operate an electric plant in New Cumberland and transmit electricity across the river from Freemans by cable or aerial lines.

## Personal.

*MR. HENRY L. DOHERTY*, who is expected back from abroad on Aug. 20, was the guest of the Institution of Gas Engineers at its meeting in Glasgow, Scotland, last month.

*MR. CLARENCE P. KING* has been elected president of the Washington Railway & Electric Company and the Potomac Electric Company, Washington, D. C., succeeding Mr. C. F. Norment, resigned.

*MR. JAMES H. WISE*, who has for the past eight years been with the Pacific Gas & Electric Company, has been appointed assistant general manager of that corporation with headquarters in San Francisco.

*MR. W. I. BARCLAY* has been appointed chief engineer of steam plants of the Portland Railway & Light Company, Portland, Ore., to succeed Mr. B. W. Slocum, who has become general manager of the Oregon Dry Dock Company.

*MR. R. H. FENKHAUSEN*, who for the past six years has been chief electrician at the Risdon Iron & Locomotive Works, has joined the staff of the Union Iron Works Company, of San Francisco, as electrical engineer.

*PROF. C. L. CORY*, of the University of California and of San Francisco, has been retained by President Huntington, of the Washington Water Power Company, to make an independent valuation of the company's holdings in and near Spokane.

*MR. E. S. LINCOLN* will build at Brookline, Mass., a laboratory for testing purposes and research work, one of the features of which will be an equipment for high-voltage testing, including a 200-kw transformer with its secondary wound for 400,000 volts.

*DR. GEORGE L. HOXIE*, New York, who recently served as consulting engineer for the Board of Public Utilities in fixing the energy rates in Los Angeles, is now in San Francisco investigating certain hydroelectric and irrigation properties for the owners of which he is acting as consulting engineer.

*MR. PHILIP TORCHIO*, electrical engineer of the New York Edison Company, was recently honored by the Italian government with the decoration Cavaliere of the Crown of Italy. The decoration is usually bestowed in recognition of meritorious work or signal service to the government or people.

*MR. ALEX. DOW*, of Detroit, Mich., who has been acting as consulting engineer for the Toronto Hydroelectric System, which distributes energy purchased from the Hydroelectric Power Commission of Ontario, in Toronto, Ont., no longer acts in that capacity, having tendered his resignation a few weeks ago.

*MR. D. A. HEGARTY* has been appointed general manager of the railway and lighting departments of the New Orleans Railway & Light Company, New Orleans, La. Mr. Hegarty, who is a graduate of the University of Pennsylvania, was formerly vice-president and general manager of the Little Rock Railway & Electric Company, Little Rock, Ark.

*MR. GEORGE W. MARTIN*, at one time editor of the *Electrical Age*, and more recently connected with the publicity department of the Babcock & Wilcox Company, has become associated with the New York Service Company as general manager. The company is engaged in power-plant management, building management and steam-heating work.

*MR. CLYDE W. TORREY*, superintendent of the Avon (N. Y.) Electric Company for twelve years, has resigned to take a position with the Long Island Lighting Company at Islip, L. I. Four electric companies have been recently merged on Great South Bay and Mr. Torrey will have charge of these concerns and the construction of 70 miles of new transmission lines. Frederick Rowe, engineer of the Avon station, has been promoted to succeed Mr. Torrey as superintendent.

*MR. JAMES H. WISE*, who was recently appointed assistant general manager of the Pacific Coast Electric Company, was formerly employed by this company, dating from his graduation from the University of California in 1903, to 1910, when he resigned as hydraulic engineer for the company to become hydraulic engineer with F. G. Baum & Company. His present work will cover the construction of new steam and hydroelectric plants and additions to older plants of the company.

*MR. CHARLES J. GRIFFITH* has been appointed general superintendent of the Little Rock (Ark.) Railway & Electric Company to succeed Mr. D. A. Hegarty in charge of operation. Mr. Griffith has been with the company since 1892, except for a few years when he was connected with the Southern Engineering Company, installing electric-light plants and water-works. Until his present promotion he was superintendent of the railway department of the company, which is a Ford, Bacon & Davis property.

*MR. JAMES D. MORTIMER*, vice-president and secretary of the North American Company, has been appointed vice-president of the Union Electric Light & Power Company and will take active charge of the affairs of the company until a permanent successor to former President Alten S. Miller is elected. Mr. Mortimer, who has been acting as general manager of the Milwaukee Electric Railway & Light Company since the resignation of Mr. John I. Beggs, will divide his time between St. Louis and Milwaukee.

*MR. C. L. CAMPBELL* has been elected treasurer and purchasing agent of the Dayton Power & Light Company, with office in Dayton, Ohio. Mr. Campbell has been with the New York, New Haven & Hartford Railroad Company trolley properties for the past ten years. He was made auditor of the Consolidated Railway Company in June, 1904, and continued in charge of the accounting department of the trolley and lighting companies controlled by the New Haven road until June 30, when he resigned to accept the above position.

*MR. J. G. HENNINGER*, of Cleveland, Ohio, delivered an address on "Jewelry Store and Window Illumination" on June 27 at the annual convention of the Ohio Retail Jewelers' Association, which was held at Cedar Point, Ohio, June 26-28. Mr. Henninger's paper dealt with the various factors to be considered in the choice and location of lamps and of reflectors for satisfactory and efficient results. The talk was illustrated by stereopticon, and was supplemented by a demonstration of several types of reflectors, showing their respective fields of usefulness.

*MR. C. A. CAHILL* was appointed chief engineer of power plants of the Milwaukee Electric Railway & Light Company on July 1, succeeding Mr. C. J. Davidson, who resigned to engage in consulting engineering work in Chicago. Mr. T. D. Crocker has also been appointed superintendent of heating for the Milwaukee company, assuming charge of work formerly under the direction of Mr. Davidson's department. Both Mr. Cahill and Mr. Crocker have been associated with the company for a number of years, in immediate charge of the departments whose work they now direct.

*MR. MASON B. STARRING* has been elected president of the Chicago Oak Park Elevated Railroad Company, succeeding the late Clarence A. Knight. Mr. Starring is now president of the Northwestern Elevated Railroad Company of Chicago, and as the two companies are closely associated, the choice is a natural one. Like Mr. Knight, Mr. Starring is a

lawyer by profession. He was formerly counsel and afterward general manager of the Chicago City Railway Company. He belongs to the modern school of public-utility operators and is noted for his frankness in dealing with the public.

*MR. ARTHUR WILLIAMS*, chief inspector of the New York Edison Company, will sail on the steamship *Olympic* on July 26 for a semi-pleasure and semi-business trip abroad. Mr Williams will visit London, Paris, Berlin and Leipzig and if time permits will motor through parts of Ireland and southern France, returning to New York in September. He will seek electrical novelties for the coming New York Electrical Exhibition, but will interest himself chiefly in studying certain phases of welfare work, such as the co-operative protection movement against non-employment existing in Leipzig and social economics as exemplified by Mr. Lloyd George in London.

*MR. W. W. BRIGGS* has been appointed assistant sales manager of the Westinghouse Electric & Manufacturing Company, with headquarters at San Francisco and with jurisdiction over the Pacific Coast. Mr. Briggs has been engaged in the electrical business since 1886, when he began as a boy in the arc lamp department of the California Electric Light Company. Later he was connected with the Electric Improvement Company, and for three years, from 1893, was electrician for a mining company in Idaho. In 1896 he joined the sales force of the Fort Wayne Electric Company, and became connected with the sales department of the Westinghouse company in 1899, becoming district manager in 1905, which position he held up to the time of his present appointment.

*MR. OSBORN MONNETT* has been appointed smoke inspector of the city of Chicago by Mayor Harrison, succeeding Mr. Paul D. Bird, resigned, and the appointment has been confirmed by the City Council. Mr. Monnett, who has been Western editor of *Power*, was named on the recommendation of the chairman of the Smoke Abatement Commission, which is an advisory committee of citizens. His practical experience in power-plant operation, embracing railroad, marine and stationary work and covering a period of twelve years, followed by five years in technical journalism, make him well equipped for his new position. Mr. Monnett has resigned his editorial position and will give his entire time to his new duties as soon as he can arrange his business affairs to that end. The salary of the smoke inspector is $4000 a year.

## Trade Publications.

VACUUM HEATING.—Warren Webster & Company, Camden, N. J., have just puublished an attractive pamphlet entitled "Webster Vacuum Heating System in the Boston City Hospital." It describes the installation in the face of unusual obstacles of their "Hy-Lo" or Type "D" system in twenty-six buildings of this hospital.

ALTERNATING-CURRENT POTENTIOMETER.—H. Tinsley & Company, Eldon Park, South Norwood, England, have issued a descriptive price list of Dr. C. V. Drysdale's alternating-current potentiometer. The list touches only on some of the applications of the instrument, but enough to allow one to judge of its wide possibilities.

DISPATCHER'S SIGNALS FOR ELECTRIC INTERURBAN RAILROADS.—Bulletin No. 1001 of the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., describes in detail its dispatcher's signal system, which is a standard semaphore controlled electrically by the train dispatcher, the semaphore being located at each siding or turn-out.

ELECTRICALLY DRIVEN LAUNDRY MACHINERY.—The Hurley Machine Company, 21-39 South Clinton Street, Chicago, is sending out attractively illustrated circulars showing applications of the Thor electric laundry machines for private residences, apartment houses, public institutions, etc. One motor is connected to washing machine and wringer, so that washing and wringing may be done at the same time.

## BUSINESS NOTES.

THE STANDARD ELECTRIC MANUFACTURING COMPANY, of Chicago, has been incorporated to manufacture and sell electric fixtures and specialties. The incorporators are: E. O. Immel, George N. B. Lowes and Lester L. Falk.

THE B. F. STEVENS STAVE COMPANY, of Martinsville, Va., has bought the insulator pin and bracket business of the Pilliod Lumber Company, of Swanton, Ohio, and is now prepared to furnish oak pins and brackets in large quantities.

REWINDING OF TRANSFORMERS.—Owing to the Sanitary District of Chicago having changed its lighting distribution from 12,000 volts to 4000 volts, the Pittsburgh Transformer Company will rewind 20 transformers for the new service, the sizes varying from 5 to 50 kw.

THE METROPOLITAN ELECTRICAL SUPPLY COMPANY, Chicago, has taken the agency for the Everson Manufacturing Company vacuum cleaning machines, of which demonstrations will be made at the Metropolitan main store, 180 West Lake Street, and branch store, 62 East Jackson Boulevard.

PRIZE FOR KNIFE SWITCH "SLOGAN."—The winner of the $100 offered as a prize by the Mutual Electric & Machine Company, Wheeling, W. Va., for a "slogan" for "Bulldog" knife switches will be announced the first week in September. The Mutual company states that thousands of suggestions were received from different parts of the world.

MR. HARRY J. MARKS will hereafter act as the sole agent in the Metropolitan district for the American Engine Company, Bound Brook, N. J. Mr. Marks has installed a large number of American-Ball engines, including both simple engines and the American-Ball Angle compound engine, under a great variety of conditions and for different services.

THE CUTLER-HAMMER MANUFACTURING COMPANY has added 70,000 sq. ft. of manufacturing area to its Milwaukee factory, through its extension across the street to a large modern two-story building formerly occupied by a woodworking establishment. A number of improvements are also being made in the buildings which form the principal group of the Milwaukee factory.

FEDERAL UTILITIES, INCORPORATED.—Messrs. James M. Rhett, formerly with R. L. Day & Company; Bayard C. Hopping, formerly with Post & Flagg and Lee, Higginson & Company, and Wallace L. Durant, formerly with Millet, Roe & Hagen, have become associated with Federal Utilities, Inc. These gentlemen will act as representatives of the company in negotiating securities.

THE W. K. PALMER COMPANY, of Kansas City, Mo., has recently contracted with the Texas, Gulf & Northern Railway Company for all surveys, reports and other engineering work required in connection with this company's proposed new line from Tucumcari, N. M., to San Antonio, Tex., a distance of between 500 and 600 miles. Engineering corps will be put in the field at once and the work pushed to completion as rapidly as possible.

TAYLOR STOKERS—The American Ship Windlass Company reports two notable orders just received for Taylor stokers. The first is for twelve stokers for the New York Edison Company, making a total installation in the Waterside station of Taylor stokers for 52,650 hp of boilers. The second is for five Taylor stokers for the United States naval gun factory at Washington, D. C. These stokers are to be used under 300-hp water-tube boilers.

W. IRWIN CHEYNEY, Philadelphia representative of the Diehl Manufacturing Company for the past nine years, has resigned his position and will represent another company in the same territory with a complete line of apparatus, at a location to be announced later. Mr. Cheyney has an extensive acquaintance throughout Pennsylvania, New Jersey, Delaware and Maryland, and has been in the electrical machinery business for the past twenty-two years.

PITTSBURGH TRANSFORMERS.—A sectional catalog issued by the Delta-Star Electric Company, Chicago, is devoted to an exposition of the Pittsburgh Weatherproof transformers for use in securing new business along transmission lines. Recommendations are made as to the best method of installation, lightning protection and grounding of the secondary system. A complete description is also given of Delta-Star high tension specialties for both indoor and weatherproof mounting.

COLUMBIA LAMP MAIN SALES OFFICE.—The main sales office of the Columbia Incandescent Lamp Company, which has been located for the past nine years with the works at 2115 Locust Street, St. Louis, will be moved about Sept. 1 to the fifth floor of the Equitable Building, northwest corner Sixth and Locust Streets, St. Louis, Mo. This removal will bring the sales office of the Columbia company to the center of the business activity of the city, making it more convenient for visiting customers.

HICKS' VOLTAGE REGULATOR FOR AUTOMATIC HYDRO-ELECTRIC SERVICE.—M. A. Hicks, Springfield, Vt., has received an order from Lewisburg, W. Va., for a direct-current relay mounted in a cabinet, together with a set of worm gear, worm friction clutch, etc., for a voltage regulator to control a small hydroelectric plant which will operate automatically. This is a duplicate of apparatus supplied by Mr. Hicks in 1905 to a plant in Hartland, Vt., which was described in these columns, and which continues to operate successfully without regular attendance.

THE KNICKERBOCKER CONSTRUCTION COMPANY, with offices in the Hudson Terminal Building, New York City, has opened a Chicago office at 912-913 Medinah Building, in charge of Mr. Russel N. Edwards, as Western manager and chief engineer. Mr. Edwards was graduated from Purdue in 1903 and served four years with the Arnold Company, following which he was associated with Mr. R. S. Feurtado, consulting engineer, also of Chicago. The Knickerbocker Company acts as engineer, constructor and operator of electric railways, electric-lighting plants, transmission systems and other public utilities.

GENERAL MOTORS COMPANY'S ENGINEERING LABORATORY.—Arthur D. Little, Inc., chemists and engineers, Boston, Mass., have been selected to organize and direct an engineering department for the General Motors Company, Detroit, Mich. Mr. D. T. Randall, the resident director, has been connected with the former organization for some years, and has had extended experience in engineering problems as well as in the equipment and direction of several testing laboratories. Mr. Randall was formerly professor of mechanical engineering at the University of Illinois, and later was in charge of the fuel investigations and producer and gas-engine tests carried on by the United States government. He will be assisted in his new position by several men detailed from the Arthur D. Little, Inc., organization.

# Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JULY 11, 1911.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

997,262. ELECTRIC TROLLEY WHEEL; W. H. Mean, Ferndale, Pa. App. filed Dec. 22, 1910. The grooved body has a limited rocking motion while the extended flanges run true.

997,280. ELECTRIC CONTROLLER; A. C. Eastwood, Cleveland, Ohio. App. filed Sept. 24, 1910. A master controller and resistance cut-outs with windings to prevent operation of the master while a resistance cut-out is closed.

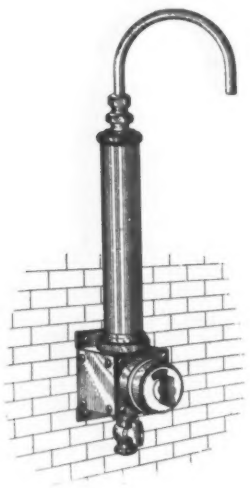
997,282. INTERIOR-CONDUIT DISTRIBUTION; F. W. Erickson, New York, N. Y. App. filed Oct. 14, 1910. "Sheet-metal-molding" joint, fitting or connection.

997,288. CONNECTING CIRCUIT FOR TELEPHONE EXCHANGES; E. D. Hall, New York, N. Y. App. filed Dec. 8, 1910. A connecting circuit for uniting lines of different character, having manual and electromagnetic means independently governing the inclusion of inductive means.

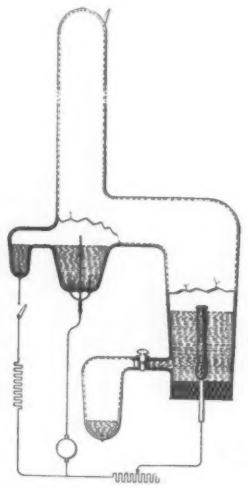
997,295. SMOOTHING DEVICE; A. Hofheimer, York, Pa. App. filed Dec. 8, 1910. A die supported by an angular hood and with a burner beneath. For ironing down an insulating coating on an electrical conductor.

997,308. TRANSMITTING APPARATUS FOR WIRELESS TELEGRAPHY; G. Marconi, London, England. App. filed July 15, 1910. A battery of low resistance in an oscillation circuit has moving terminals and bridging pieces rotated rapidly between them.

997,316. ELECTRIC SWITCH; J. Morse and F. T. Kaelin, Montreal, Canada. App. filed June 17, 1909. A knife switch for large capacity, with a lock.



997,670—Electric Water Heater.



997,882—Electric Furnace.

997,332. CIRCUIT-BREAKER; W. M. Scott, Philadelphia, Pa. App. filed May 25, 1910. A sensitive lock for a non-closable switch. A laminated main contact, a metallic shunt contact and a carbon shunt contact.

997,337. MAGNETIC SHIELDS FOR ELECTRIC MACHINES; C. H. Smoot, Chicago, Ill. App. filed Feb. 16, 1907. Stationary cylindrical shields of magnetic material surround the end portions of the rotor and cover the metal retaining bands. For high speed.

997,339. OZONIZER; Jan Steynis, New York, N. Y. App. filed Sept. 15, 1909. A hollow electrode containing an insulating liquid and a cooling pipe therein. One side of the high-tension circuit and the cooling device are grounded.

997,397. CIRCUIT CONTROLLER; A. C. Livermore, Edgewood Borough, Pa. App. filed March 16, 1911. Operated conjointly by switch-operating mechanism (see Patent No. 329,643) and by switch rails. Means for moving the contacting members and for holding them.

997,406. KEY-SOCKET SWITCH MECHANISM; H. J. Morey & F. A. Brogden, Syracuse N. Y. App. filed March 1, 1911. Rotating key and cam for moving a metal yoke into contact position and a spring for lifting. Double make and break for incandescent lamp sockets.

997,413. ELECTRIC INCANDESCENT LAMP; H. C. G. Remané, Berlin, Germany. App. filed Oct. 3, 1905. A metallic member has a smooth globular portion in which the filament is embedded by fusion and sudden cooling.

997,458. ELECTRIC BRAKE; J. N. Mahoney, Wilkinsburg, and W. M. Austin, Swissdale, Pa. App. filed Aug. 29, 1908. The running controller of a car is also employed for breaking by moving the handle backward from the usual "off" position. The axis of the handle is eccentric to an axis of rotation

997,463. ELECTRIC HEATER; F. P. Mies, Chicago, Ill. App. filed Jan. 25, 1910. A heating conductor is wound on the blades of a fan in a casing. A switch automatically closes the circuit when the fan reaches a predetermined speed.

997,467. ELECTRIC COOKER; W. Nichols, Denver, Col. App. filed March 11, 1910. A combined heater and "fireless" cooker. Heating coils are arranged in a disk (on legs) to be inserted in a non-heat-conducting receptacle.

997,515. SIGNALING APPARATUS; H. Shoemaker, Jersey City, N. J. App. filed Nov. 15, 1910. "Wireless" transmitter. A link circuit having inductance and substantially no capacity transfers energy from a high-frequency oscillation producer to a radiating conductor.

997,516. RECEIVING APPARATUS; H. Shoemaker, Jersey City, N. J. App. filed Nov. 15, 1910. "Wireless" receiver. A division from Patent No. 997,515. A link circuit having inductance and substantially no capacity is in inductive relation with an aerial receiving conductor and a receiver circuit.

997,520. CONTROLLER; M. S. Towson, Cleveland, Ohio. App. filed May 19, 1909. A motor having two sets of field-coil sections and a controller having means for varying the relation of the sections of one set with respect to one another and for varying the number of effective sections of the other set.

997,576. TROLLEY FOR ELECTRIC RAILWAY; J. H. Mountain, Terre Haute, Ind. App. filed March 31, 1911. A "harp" yieldingly held against rotation in a tubular pole. Tubular bosses for the wheel engaged by springs.

997,579. DYNAMO-ELECTRIC MACHINERY; C. A. Parsons and A. H. Law, Newcastle-upon-Tyne, England. App. filed July 9, 1909. Auxiliary conductors in the air gap (of a rotating armature) connected in parallel with embedded conductors to reduce tendency to spark.

997,589. MIXTURE FOR COATING ELECTROTYPE-MOLD FORMS; A. J. Williams, Washington, D. C. App. filed Dec. 14, 1910. Graphite, lampblack and alcohol. The wax impression surface is first coated with graphite and alcohol.

997,590. INDICATOR-ACTUATING MECHANISM; T. P. Wilson, Los Angeles, Cal. App. filed March 14, 1910. A track switch for electrically actuated station indicators. A depending arm from the car is forced into contact with the rail.

997,594. TELEPHONE REPEATER; W. Anderson, Longdale, Okla. App. filed Nov. 12, 1909. For long-distance work. Two transmitters, two receivers and two inductoriums.

997,597. CURRENT COLLECTOR OR TROLLEY; W. Arter, Richmond Hill, N. Y. App. filed Dec. 28, 1908. A contact roller journaled in the ends of a resiliently supported frame, resilient supporting arms for supplemental conductors mounted between parallel plates on the frame.

997,598. LOCK FOR SOCKET SHELLS; T. A. C. Both, New York, N. Y. App. filed April 29, 1911. Locking bolts parallel to the axis pass through flanges in the body and screw into a flange on the cap. For use in "husks."

997,610. PROCESS OF MAKING ONE-PIECE RADIATOR SECTIONS; F. A. Feldkamp, Vailsburg, N. J. App. filed Sept. 15, 1910. Two deposits are electrolytically made on a core and the core removed.

997,651. TELEGRAPHIC RECORDING APPARATUS; T. McClelland De Bingham, London, England. App. filed July 22, 1910. The rays of light from a meniscus in a capillary tube pass through a microscope and are received on a photographic plate.

997,670. ELECTRIC WATER HEATER; J. H. Hallberg, New York, N. Y. App. filed Jan. 31, 1908. A tapered heating coil is positioned in the heater so that water may flow therethrough. Attached at the base of the faucet.

997,681. COMBINED THROTTLE AND AUTOMATIC STOP VALVE; A. W. Lenderoth, Stapleton, N. Y. App. filed Nov. 19, 1910. For protecting steam engines (etc.) from overspeeding in case of governor failure.

997,692. SIGNALING APPARATUS; C. P. Nachod, Philadelphia, Pa. App. filed Oct. 13, 1908. Railroad block light and disk in a casing.

997,756. TELEPHONY; G. C. Cummings, Western Springs, Ill. App. filed Oct. 14, 1909. Connection between substation and central station. The telephone receiver at a called station constitutes the signal receiver.

997,759. ELECTRIC SWITCH; C. W. Denny, Kennsington, London, England. App. filed July 30, 1910. Automatic tumbler for lighting or small power circuits.

997,768. PROCESS OF MAKING ONE-PIECE RADIATOR SECTIONS; F. A. Feldkamp, Vailsburg, N. J. App. filed Sept. 15, 1910. Division from Patent No. 997,610. Metal is deposited on the surface portion of the core within the opening and outwardly.

997,838. THERMO-ELECTRIC CIRCUIT-BREAKER; E. W. Leeper, Chicago, Ill. App. filed May 28, 1904. A toothed wheel is secured by a heat-susceptible compound on a resistance rod. A spring-controlled mechanism controls catch and tends to turn the rod.

997,879. TREATMENT OF REFRACTORY MATERIALS; E. Weintraub, Schenectady, N. Y. App. filed Dec. 4, 1906. Impure boron is heated in a mercury-vapor arc. The product is washed and decanted.

997,880. TREATMENT OF REFRACTORY MATERIALS; E. Weintraub, Lynn, Mass. App. filed Dec. 4, 1906. Division of Patent No. 997,879. A conducting body is treated as an anode in a mercury-vapor arc operating in hydrogen.

997,881. APPARATUS FOR THE TREATMENT OF REFRACTORY MATERIALS; E. Weintraub, Schenectady, N. Y. App. filed Dec. 4, 1906. Division of Patent No. 997,879. A mercury-arc container serves as a furnace.

997,882. ELECTRIC FURNACE; E. Weintraub, Lynn, Mass. App. filed July 2, 1906. A furnace charge serves as anode for heating arc in a sealed envelope. Division from Patent No. 997,883.

997,883. TREATMENT OF REFRACTORY MATERIALS; E. Weintraub, Schenectady, N. Y. App. filed July 2, 1906. A powder (such as tantalum) is compressed unto a coherent body and used as an anode in an envelope with a mercury arc.

997,897. ELECTRIC RAILWAY SWITCH-OPERATING MECHANISM; H. L. Blattle, Providence, R. I. App. filed Dec. 27, 1909. The switch tongue is thrown automatically by the use of electromagnets controlled by the motorman.

997,924. THERMO-ELECTRIC CIRCUIT-BREAKER; E. W. Leeper, Chicago, Ill. App. filed May 28, 1904. Division from Patent No. 997,838. Self-soldering; may be used also as a push-button switch.